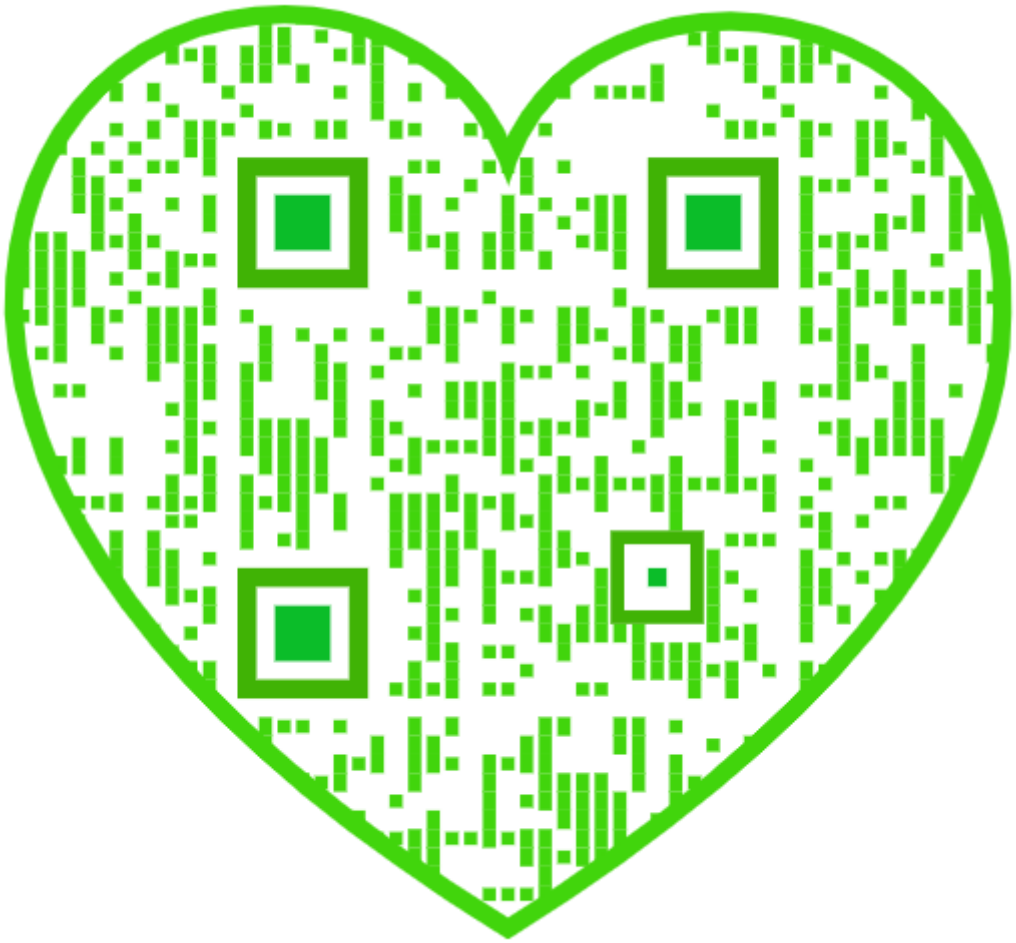
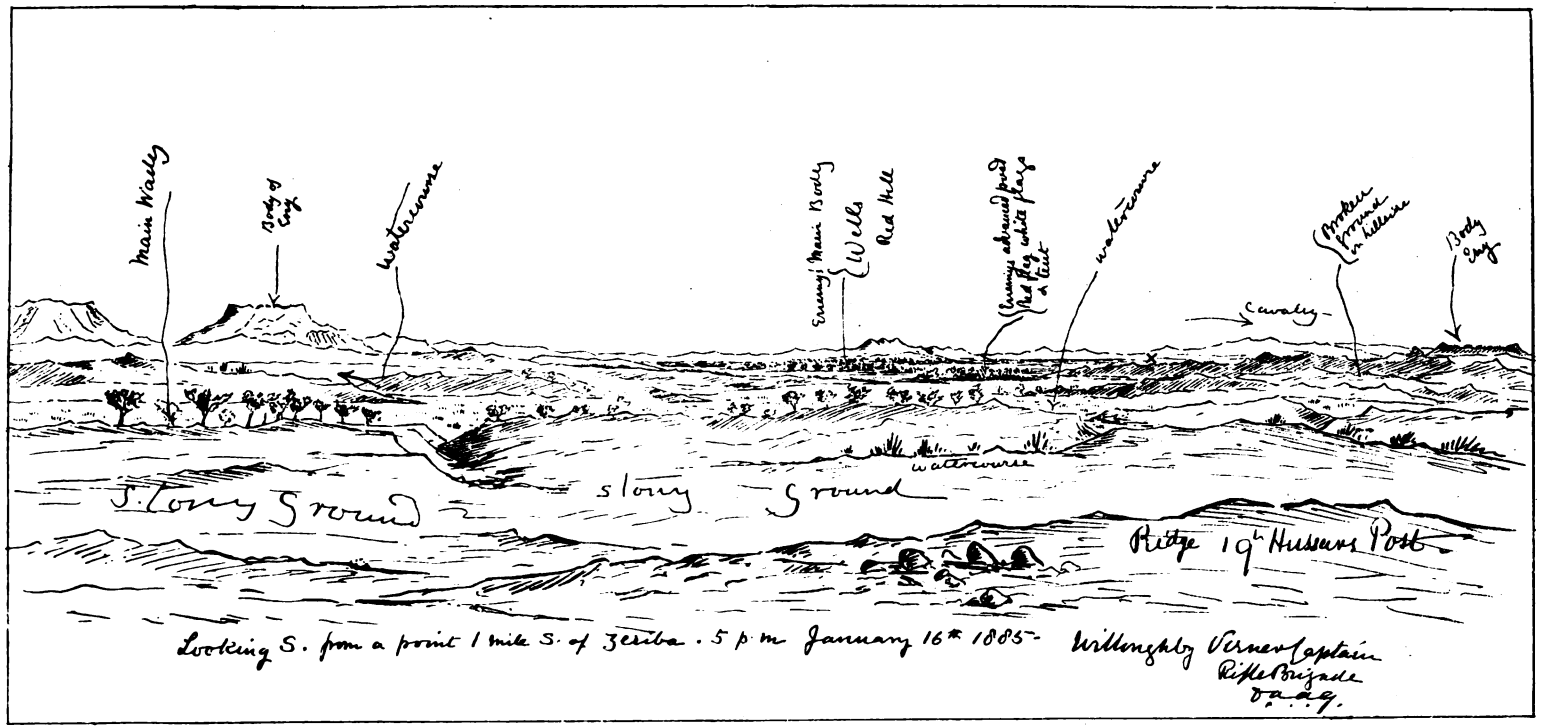




Reconnaissance Sketch of the Arab Position at Abu Klea.

Facsimile of Sketch made on afternoon preceding the action of Abu Klea, when reconnoitring the Arab position with a party of the 19th Hussars. About two miles in advance of the Wells a long line of banners were planted right across the valley, the "tent" being about the centre of the position. Strong bodies of Arabs also crowned the hills on either side of the valley, and could be seen massed along the ridges and spurs falling into it. The total length of their position thus barring our advance to the Wells was about 3,000 yards, and was held by 10,000 to 12,000 men. As soon as the Arabs detected our presence they pushed forward some riflemen across the broken ground on the hillsides, as shown on the right of the Sketch, and opened fire; at the same time some of their cavalry moved rapidly up one of the valleys so as to threaten our right flank. On the conclusion of the Reconnaissance the 19th Hussars were withdrawn to the Zeriba. The Arabs, who had advanced against us, shortly afterwards crowned the heights on our right, whence they fired into our bivouacs all night.

The cross (×) has been added to indicate the position of the Square when charged by the Arabs on the following morning.

The Sketch was taken from a point about forty-eight miles from the Wells of Gakdul, and twenty-eight miles from the Nile at Metemneh.

RAPID FIELD-SKETCHING

AND

RECONNAISSANCE.

BY

CAPTAIN WILLOUGHBY VERNER,

RIFLE BRIGADE;

D.A.A.G. FOR INSTRUCTION, SOUTH-EASTERN DISTRICT;

AUTHOR OF "SKETCHES IN THE SOUDAN," ETC.

LONDON:

W. H. ALLEN AND CO., 13, WATERLOO PLACE. S.W.

1889.

(All rights reserved.)

~~XIII. 3331~~
War 1058.89

HARVARD COLLEGE
FEB 26 1896
LIBRARY.
Bright fund.

LONDON:

PRINTED BY W. H. ALLEN & CO., 13 WATERLOO PLACE. S.W.

CONTENTS.

CHAPTER I.

THE REQUISITES FOR RAPID FIELD-SKETCHING - - - - - 1

CHAPTER II.

SKETCHING WITH THE AID OF MAPS - - - - - - - 16

CHAPTER III.

SKETCHING WITHOUT THE AID OF MAPS - - - - - - 30

CHAPTER IV.

RECONNAISSANCE ON A COMPASS-BEARING - - - - - 46

CHAPTER V.

SKETCHING BY TIME - - - - - - - - - - 60

CHAPTER VI.

SKETCHING WITH THE AID OF A RANGE-FINDER - - - 68

APPENDIX - - - - - - - - - - - 81

LIST OF FIGURES.

		PAGE
	Landscape-Sketch of Valley of Abu Klea .. .. .. *Frontispiece.*	
Fig. 1.	Cavalry Sketching-Case	5
2.	"Setting" the Sketching-Case	6
3.	Observation of an Angle of Elevation or Depression	8
4.	The Clamped Roller	9
5.	Observation of the Slope of the Profile of a Hill	11
6.	The Sketching Hold-all	12
7.	The Road Pencil..	13
8.	New Pattern Cavalry Sketching-Case (Front View)	12
9.	New Pattern Cavalry Sketching-Case (Back View)	14
10.	Adjusting the Working Meridian	19
11.	The Graduated Compass Ring	20
12.	Ascertaining the Bearing of a "Line of Direction"	22
13.	Rough Sketch of portion of 1" Ordnance Map..	24
14.	Skeleton Route, enlarged from Fig. 13	25
15.	Skeleton Route, with Notes made on it in the Field	26
16.	Skeleton Route "finished up"	27
16*.	The Straight-edged Ruler prepared for Sketching on Horseback	35
17.	Landscape-Sketch showing Three "Forward Bearings"	36
18.	Plan showing Three "Forward Bearings" from one point..	36
19.	Example of Noting Intervals and Objects when Sketching on Horseback	37
20.	Example of Sketching a Road which zig-zags	38
21.	Example of Sketching a Road which changes its general direction	38
22.	Table of Trots for determining the Scale upon which a Sketch is drawn	44
23.	March on a Compass Bearing	51
24.	Sketch on a Compass Bearing	55
25.	Sketch by reckoning Telegraph Poles	59
26.	"Time Sketch," without aid of Maps	64
27.	"Time Sketch," with aid of Maps	65
28.	"Time Sketch" on Steamer	66
29.	Sketch from Two Points with aid of Range Finder	74
30.	Sketch from One Point with aid of Range Finder	75
31.	New Pattern Portable Tripod	77
32.	Case for Tripod for Cavalry Sketching-Case	77
33.	The Cavalry Sketching-Case used as a Plane Table	77
34.	Extended Reconnaissance Sketch with aid of Range Finder	78

RAPID FIELD-SKETCHING

AND

RECONNAISSANCE.

ERRATUM.

For ruler shown in Fig. 16,
read ruler shown in Fig. 16*.

"Road Pencil."—Articles required for "finishing up."—The straight-edged Ruler, how used and carried.

THE subject of rapid field-sketching, on foot or on horseback, is one which opens up a very wide field to any officer with a good eye for a country, and who is also able to make use of his fingers. I am far from saying that a man must be a good freehand draughtsman in order to be able to execute a military sketch, but I am strongly of opinion that the man who can draw is, to use a nautical expression, many points to windward of the man who cannot. The latter may, by dint of the most laborious exertions, succeed in time in turning out a decent sketch, but the more the work in which he is engaged departs from the rigid rules of a scientific survey, and approaches to that of the landscape sketcher, the further behind lags the man who has neither a turn nor an eye for drawing.

To the uninitiated it would appear to be almost unnecessary to pass any remarks on the subject, but it is a fact, albeit a

somewhat absurd one, that many a man who is perfectly candid in admitting his want of knowledge in other technical military matters, will not allow for a moment that his sketching is not all that can reasonably be desired, and not uncommonly looks upon any criticisms on his performances in that line as almost a personal affront. If it be granted that the essence of military sketching is rapidity, and that the quicker a man's eye takes in a bit of ground, and the more accurately his mind retains an impression of the same, the better will be his work, can it be doubted which man, the draughtsman or the non-draughtsman, will be the most likely to produce a *useful* sketch in a given time?

It must be remembered that a sketch is generally made for the information of some person who has not yet seen the ground in question, hence the only real test of its value is its capability of conveying a true impression of the portion of ground it represents to others. I would wish, therefore, to start on the subject of rapid field-sketching, either mounted or on foot, with the following assumption, namely, that in order really to attain great facility in this line, and to produce useful sketches against time, it is an enormous advantage to have a natural taste for freehand drawing, and that the man with this talent will, ninety-nine times out of a hundred, distance the man whose only knowledge of using his pencil is derived from studying military surveying.

Now this taste for freehand drawing need not be a very developed one, but the more developed it is, the better and easier will a man when engaged in military sketching draw the detail which he wishes to place on record.

I do not want to discourage anybody from attempting to master the art of rapid field-sketching, in spite of their natural inability to draw. I only want to put it plainly before them that they are embarking on an undertaking in which they are very heavily handicapped, and I would say to all of them that they must not be disheartened or surprised if they see men who possess the turn for drawing distance them in the race.

That it is possible for men to become excellent map drawers, giving them plenty of time and instruments, is altogether beside the question. I deal only with *rapid field-sketching*.

Before proceeding further I wish it to be distinctly understood that I am not going to make any startling revelations or divulge

any new processes with regard to field-sketching. The subject has been exhaustively treated in all its technical details by people far more competent to do so. All I seek is to endeavour to describe the various methods by which sketches and reports can, in my opinion, be most rapidly and efficiently executed in the field, and at the same time to give all the information I can on certain minor points which experience has taught me are well worthy of attention.

For rapid work in the field, nothing can equal the "cavalry sketching-case" as it is commonly called, and it is with this little instrument that I propose to deal in the following pages. It is the invention of Colonel W. H. Richards, for many years Professor of Military Topography at the Staff College, and to whom I am indebted for my first lessons in its use. For some years it has been the custom to instruct officers to survey with the prismatic compass, and the natural result is that it is the exception to come across any who are acquainted with the use of these sketching-cases. Of course, there are men to be met with now and again who have learned to use them at special classes of instruction, as at the Staff College; but these are the exception, and I have over and again seen men who were excellent draughtsmen with the ordinary tools of the craft, but who were totally unacquainted with the simpler, more rapid, equally effective, and more soldierly method of working with the cavalry sketching-case. Indeed, I shall never forget my feelings on one memorable occasion when, after having equipped a friend with my own favourite sketching-case, and, as I imagined, given him full instructions as to how to proceed, he returned it to me with thanks, and an intimation that he had found it so complicated that he had "fallen back on the simpler method" of carrying a large board, prismatic compass, protractor, etc.

It is owing to similar experiences that I have been induced to write the following, as I am convinced that when once any man has mastered the extremely simple process of sketching with this board, he will never use anything else for rapid work in the field.

"Well-informed people" are, therefore, warned off, and are respectfully requested not to waste their time in perusing the following very elementary treatise.

In order to use a cavalry sketching-case with effect, it is, of course, absolutely necessary to have a thorough knowledge of the

ordinary details of "Military Topography" which come successively into play during the process. These are especially:

(*a*) The construction of scales both for distance and time for foot and mounted work.
(*b*) The principle of contouring.
(*c*) Sketching with the plane table.

Anybody can become proficient in these with a reasonable amount of study; those which can only be properly acquired by constant practice in the field are:

(1) The power of approximately estimating distances, and of judging gradients of roads, slopes of hills, and elevations of high ground at a distance.
(2) The facility of drawing in on the sketch any particular detail (such as a farmstead, a railway, or stream) at some distance from the road at the proper interval (as estimated by the eye in No. 1) without having recourse to the scale of yards on the ruler.
(3) The habit of drawing in rapidly the *general* direction of a road or of any particular object without observing its direction precisely as with a plane table.

But all these are of little avail if a man has not the power of taking instantaneous mental notes of everything which comes within his view or knowledge, and which is likely to be of importance in military operations. It should be the great aim and object of every man who aspires to be good at reconnaissance so to discipline his powers of observation for each day's work that he instinctively notices everything of military importance, giving prominence to those details which are of especial value with regard to the particular nature of the work on hand.

For the benefit of those who are unacquainted with the cavalry sketching-case, I will now describe it in detail. Colonel Richards' original case (see Fig. 1), which embodies the principle of all those since constructed, is a small drawing-board A about six inches square, fitted with wooden rollers B B′ on either end, which revolve in sockets in a head-piece C C′ and a foot-piece D D′ fixed on opposite sides. On these rollers a strip of paper of any required length, say 2 ft. or more, is wound and thus stretched across the board A. In the head-piece C C′ a small magnetic compass E is countersunk in a collar in which it can be revolved.

On the glass of the compass a fine line is engraved, which is termed the "working meridian."

In the centre of the back of the board there is a metal pivot to which a strap is attached, which latter is used to secure the board on the left wrist when working with it. To use the board, the "working meridian" is set in the required position by turning the compass-box round in its socket. The relative position of the "working meridian" to the board itself, having thus been determined, the board is "set" for sketching by revolving

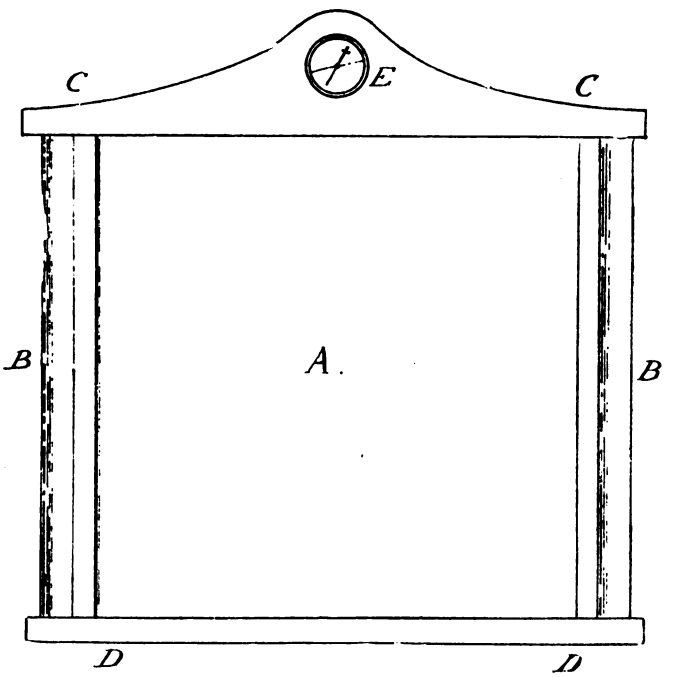
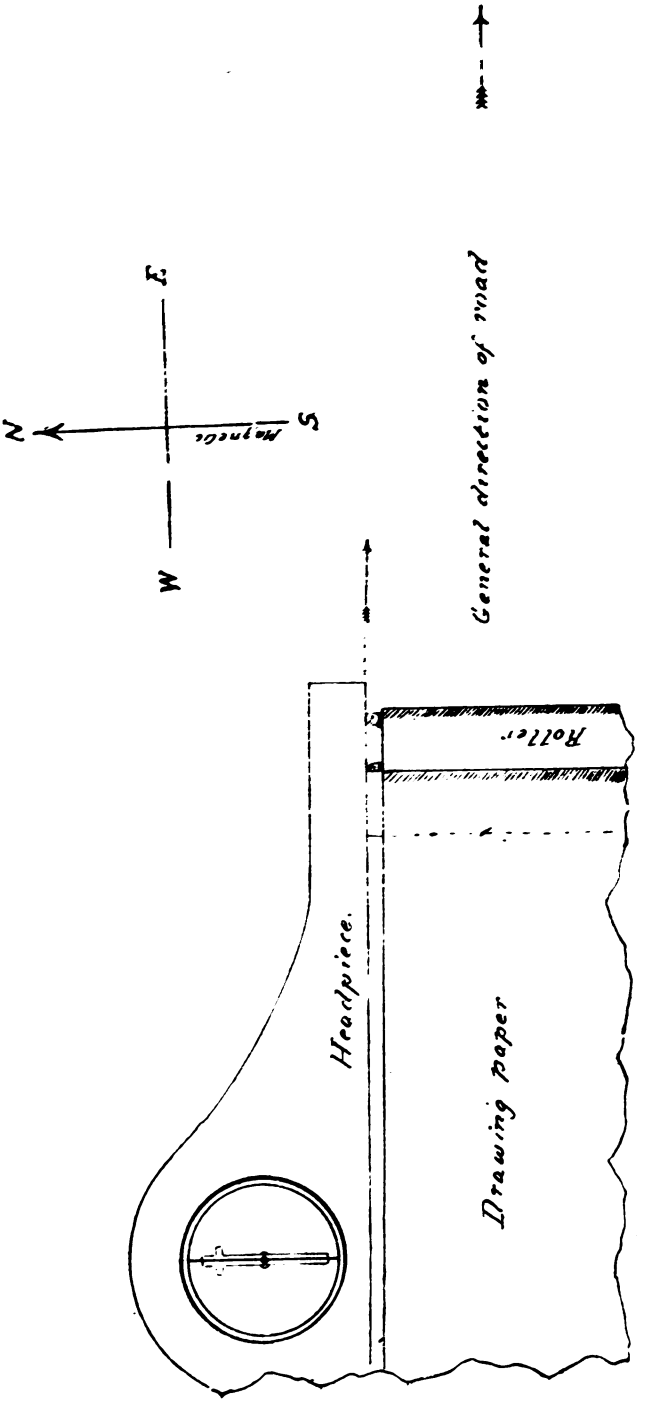


FIG. 1.

it on the pivot beneath it until the "working meridian" coincides with the direction of the magnetic needle when at rest. (Fig. 2.)

To take an example, supposing that it be required to sketch along a road running east. It is obvious that to get full advantage out of the board, it would be necessary to "set" it so that the length of paper on it corresponded with the general direction of the road, that is, so that the inner edge of the head-piece pointed to the east. This being the case the needle would necessarily be at right angles to the road, and it is plain that if the



N.B The Magnetic Needle has been drawn larger than it actually is, so as to distinguish it from the "Working Meridian" with which it is here shewn to coincide.

FIG. 2.

"working meridian" be adjusted in this position and the board turned until the needle coincides with it, it will be truly "set" for sketching along the road in question. Fig. 2 shows a board thus adjusted.

It will be gathered from the above that the cavalry sketching-case is nothing more than a miniature and portable form of the plane table, and hence that to use it with effect it is advisable to practise sketching with that instrument, or with the more rough and ready makeshift of a common drawing-board and a magnetic compass.

With the sketching-case, the ruler provided with sight-vanes, as used with the plane-table, is replaced by a simple straight-edged piece of wood, with which the direction of any distant object is noted by aligning the ruler on it and marking its position on the sketch with a pencil line. It is undeniable that this process is a rough one, and likely to strike the scientific surveyor aghast; but it should be borne in mind that rapid field-sketching and surveying are two very different things, and, further, that it has been proved over and over again that this apparently rough and uncertain process is *quite sufficiently accurate for ordinary military purposes.* Indeed, when used dismounted, the board being carried in the hand in lieu of being strapped to the left wrist, almost any ordinary degree of accuracy (such as with a prismatic compass) can be obtained by combining the process of an "eye sketch" with that of the "plane table."

Having thus explained the general principle of these boards, it will be necessary for me to describe particularly the pattern I at present use,* since many of the details of sketching which I am about to discuss cannot be carried out in the field on a board unprovided with some of them at least.

The first question which naturally presents itself when deciding upon a board of this sort is the size. Portability is the essence of all the articles of a soldier's kit, and it is necessary to have a board which can be carried or stowed somewhere without causing inconvenience. Thus a board which can be carried in an ordinary sabretasche, or an officer's haversack, or a roomy pocket, is about the most convenient size, and after various experiments I have found this to be about 9 inches wide (across board and compass), and 7 inches long (across from roller to roller). This will permit of a width of paper of 7½ inches, which at a scale of 2 inches or

* Manufactured by Messrs. Elliott, Instrument Makers, 101, St. Martin's Lane, W.C.

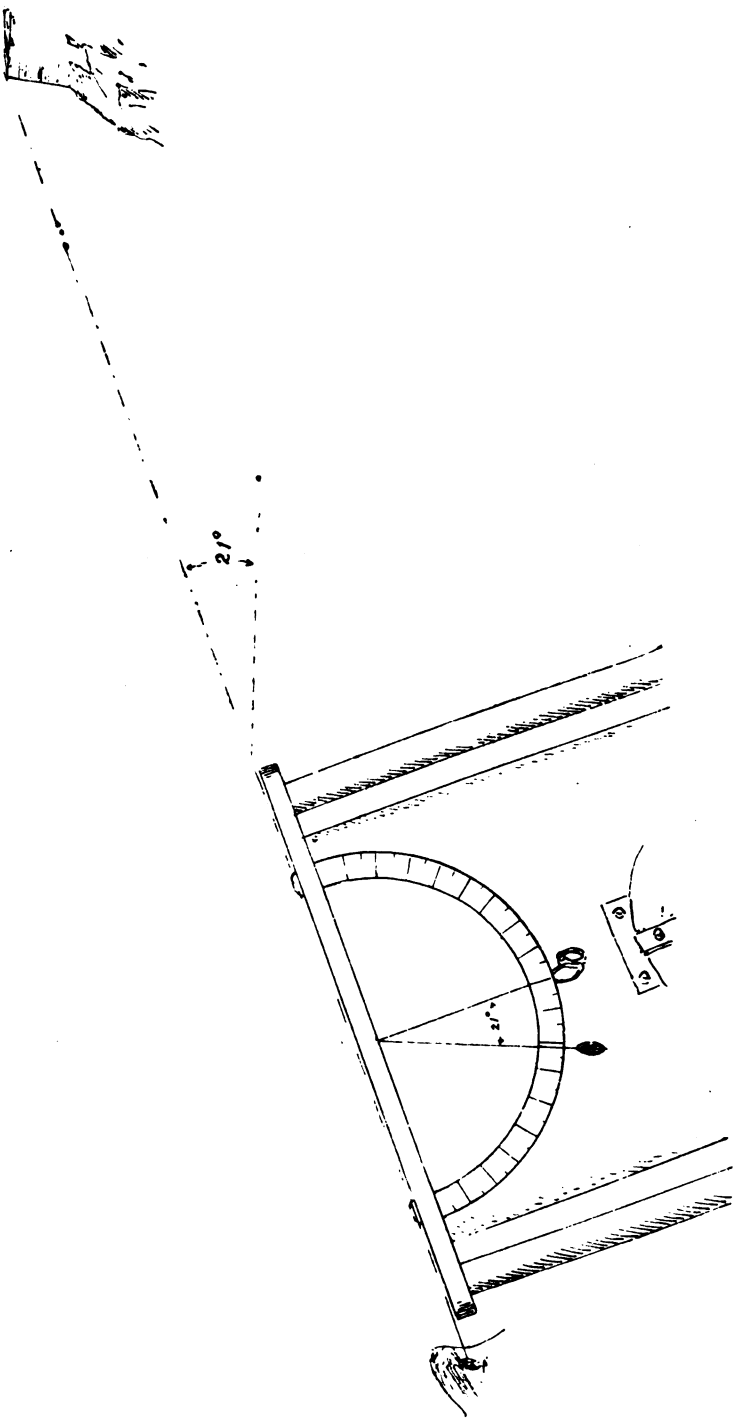


FIG. 3

3 inches to a mile will take in a considerable extent of country. It is obvious that practically an unlimited *length* of paper can be carried by reason of the rollers.

A very convenient way of carrying the board when not in use is in a leather case, which can be strapped to the saddle after the manner of a shoe-case, or carried on a waist-belt when working on foot.

One of the most vexatious things in working with a cavalry sketching-case, is the liability of the rollers in time to work loose, when they fail to stretch the paper across the board, and it consequently bulges out and offers an impossible surface to draw upon. The discomfort caused by this can only be realised by those who have experienced it when sketching under arduous circumstances. I have endeavoured to obviate this by providing each roller with a clamping screw at one end, by which means they can be regulated to any required degree of stiffness. The annexed diagram will explain itself. (See Fig. 4.) In order to clamp the roller, a turn of the screw C brings the point of the pivot B against the interior of the roller at A. The small stud is to prevent the screw working out and being lost.

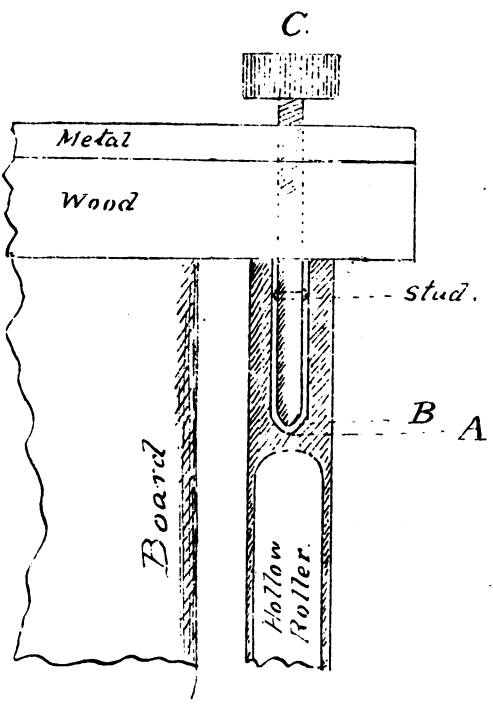


FIG. 4.

Since the correct adjustment of the working meridian is a very important factor in the process of sketching with one of these boards, I recommend that the magnetic compass should be sunk in a metal collar graduated into divisions of ten degrees. This enables the position of the meridian to be noted, and affords other advantages into which I will enter more fully hereafter.

It is a great advantage to have the scales most commonly used

in surveying engraved on the metal footpiece, &c., of the board, and for the reason that so long as the board itself is at hand, no other instruments are required. In a campaign in a civilized country the loss of a protractor might be a matter of little moment, but to the British officer who so frequently is called upon to serve in some savage and remote part of the world, it entails extreme inconvenience. The scales that are probably the most useful, and which I have adopted, are the following:—

1. A scale of inches and tenths of an inch.
2. ,, ,, 4 inches to a mile, to show 50 yards.
3. ,, ,, 6 inches to a mile to show 50 yards.
4. ,, ,, horizontal equivalents—normal.
5. ,, ,, H.E. for 30 feet vertical intervals at 3 inches to a mile.

With these, it is possible to do any ordinary work. No. 1 enables any particular scale required (such as for a horse's paces) to be constructed with sufficient accuracy. Nos. 2 and 3, being divided into fifty yard intervals, can be used for scales of 2 inches and 3 inches to a mile, and, of course, for any multiples of 4 and 6. The last (No. 5) is a very useful working scale for sketching on horseback.

I have found it to be a decided advantage under certain circumstances to be provided with a clinometer, and a very fair makeshift one can be made by screwing a semi-circular boxwood protractor on the back of the board. A plumb-bob is suspended from the centre of the foot-piece, and when not in use is fitted into a cavity in the back of the board, where it is retained by a small catch. This clinometer is used after the fashion of the old Sandhurst pattern instrument of that name, the screws attaching the footpiece to the board making good fore and back sights wherewith to take the elevation or depression of objects.

Again, by holding the board sideways, it is easy to ascertain the slope of the profile of a hill. This is often a great help to a sketcher, and cannot be done with the "Watkin," clinometer, although the "Abney" level admits of it. If ordinary care be used, it will be found that the wind will affect the result of any observations taken with this clinometer to a very small extent on account of the board sheltering the plumb-line.

I am perfectly aware that most skilful draughtsmen say that they prefer to estimate slopes by eye rather than by a make-

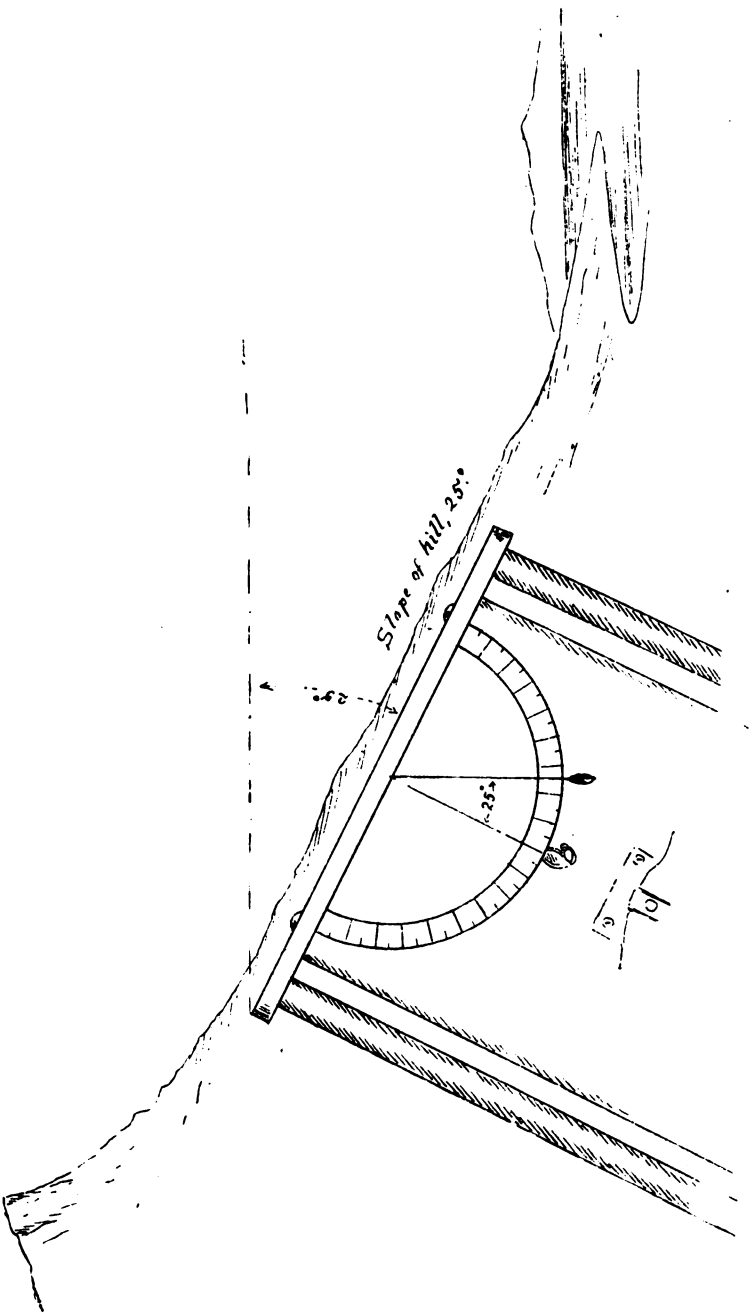


FIG. 5.

shift clinometer, but the ordinary sketcher requires some such assistance from time to time if only to give him confidence, and occasions may arise when it is of great importance to make the most accurate observations practicable under the circumstances.

A very useful plan is to graduate the headpiece and footpiece of the board into divisions of one inch at points exactly opposite to one another. This enables a sketch to be divided into sections of one inch or more by ruling lines from one graduation to that opposite to it. This is especially useful when sketching by "time," or when working with the aid of maps, which it is desired to enlarge and fill in with military details.

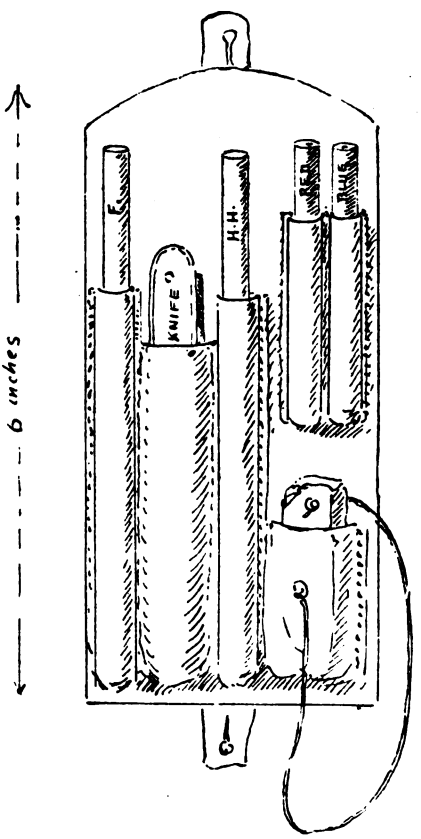
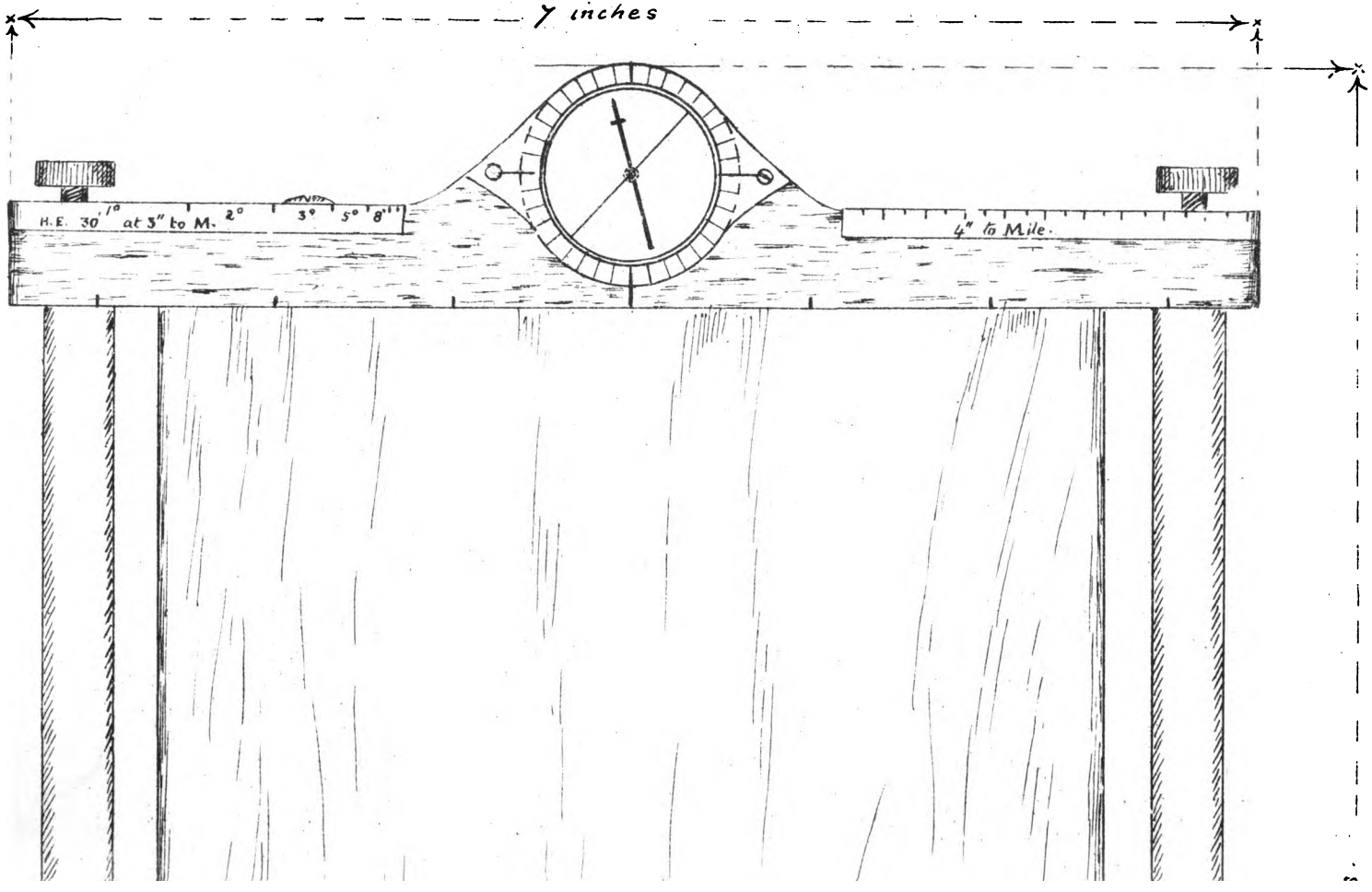


FIG. 6.

So much for the board, now for the tools required to work with, I am one of those who look upon no detail as too trivial to be alluded to, when a question like sketching in the field is under discussion, for it is precisely by bestowing the most careful attention on such minor points as a hard or soft chalk pencil, or a blunt or pointed black-lead one, that a sketch may prove to be of the greatest value owing to its clearness, or to be so confused as to be practically useless.

In rapid sketching, especially when mounted, it is a great advantage to carry the pencils actually required for constant use in some sort of hold-all. These can be made or obtained in every size and shape, but after testing innumerable patterns, I have come to the conclusion that the best sort is the simplest possible. This I take to be one that will carry a couple of black pencils, a small bit of red and blue chalk, a penknife, and a piece of hard indiarubber. I say two black pencils, for if one be dropped or broken, there is a reserve


7 inches
H.E. 30' 1° at 3" to M. 2° 3° 5° 8°
4" to Mile.

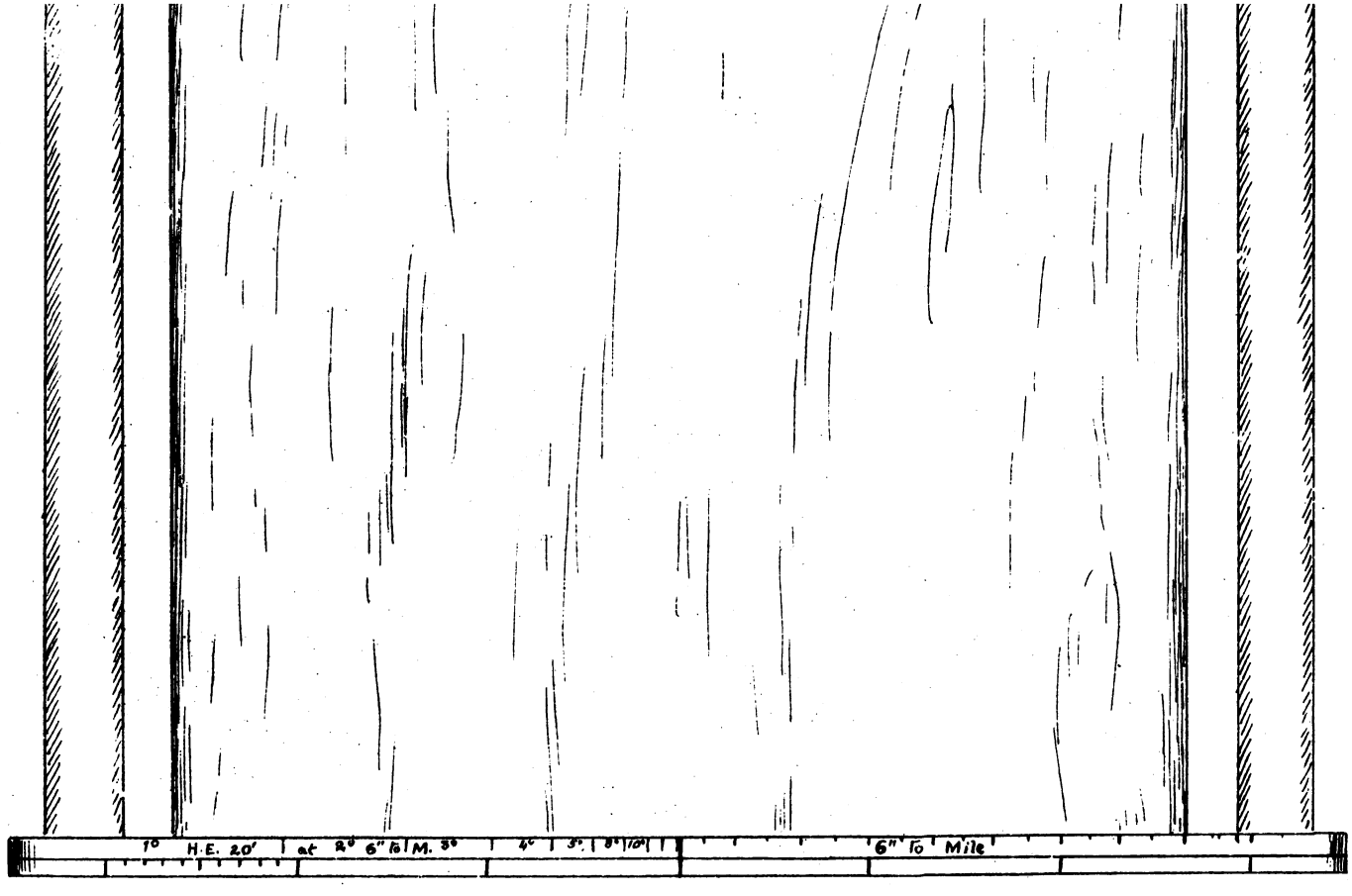


FIG. 8.—The Cavalry Sketching-Case (new pattern). Front View of Instrument.

one handy. The red and blue chalks are used now and again to mark any important detail, such as a masonry wall or a stream, which in an extended sketch, may become partially obliterated and perhaps omitted during the process of cleaning up. The indiarubber is, *of course*, attached by a piece of string to the hold-all. Now, although I advocate indiarubber to be carried, I do not recommend its use except now and again, when necessary to clear up some confused part of the sketch; should any line be drawn in error, the best way is to erase it with a few short diagonal strokes on the spot, and to rub it out when finishing up the work. I trust it is needless to caution anybody as to the fatal effects of using indiarubber in wet weather. The hold-all can be either buttoned on the breast of the jacket, or on the stud of the off wallet. Undoubtedly the most effective method of finishing up a sketch is with Indian ink and water-colours. This process is, however, generally inadmissible in the field, and recourse must be had to ordinary pen and ink or pencil and coloured chalks. I would always advocate pen and ink being used when possible, because when a sketch is in the somewhat confused condition inseparable from rapid work in the field, it is easy to pick out the detail and write in the notes clearly over the rough jottings made with pencil. The whole sketch can then be cleaned with a hard bit of indiarubber, or piece of stale bread, and the coloured chalks applied where required. By this process there is but little danger of accidentally obliterating or omitting some important detail or note made in pencil in the field. When no ink can be

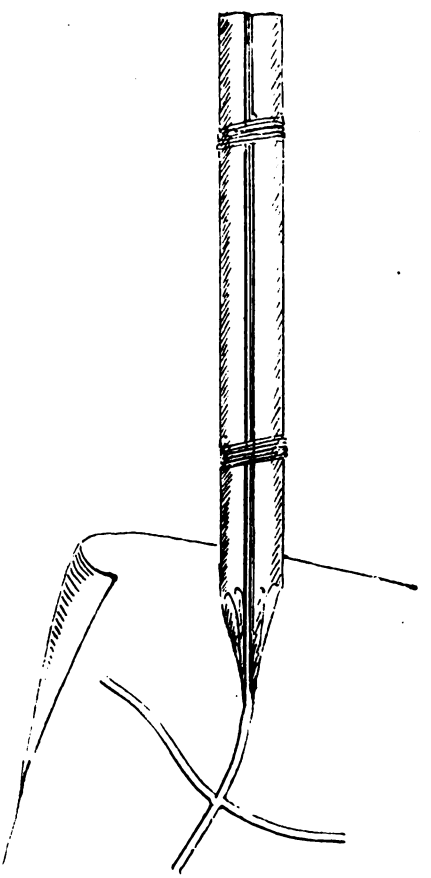


FIG. 7.

obtained, a hard indelible pencil is the next best substitute. "Solid ink" pencils are generally a failure, as they are apt to smudge if wetted by mischance.

Since most reconnaissance sketches in a civilized country have many roads in them, it is an immense saving of time and a great addition to the neatness of a sketch to use a "road-pen." In my pencil sketches I invariably use what I may term a "road-pencil," an arrangement which I make as follows:—Take a hard pencil, the harder the better, and cut it into two equal portions, next slit each of these down their middle and join the two pieces containing the lead, lashing them with string, as shown in Fig. 7.

If now the lead points be sharpened at one end and neatly scraped away on the inside edges, a most effective instrument will be provided wherewith to draw double lines.

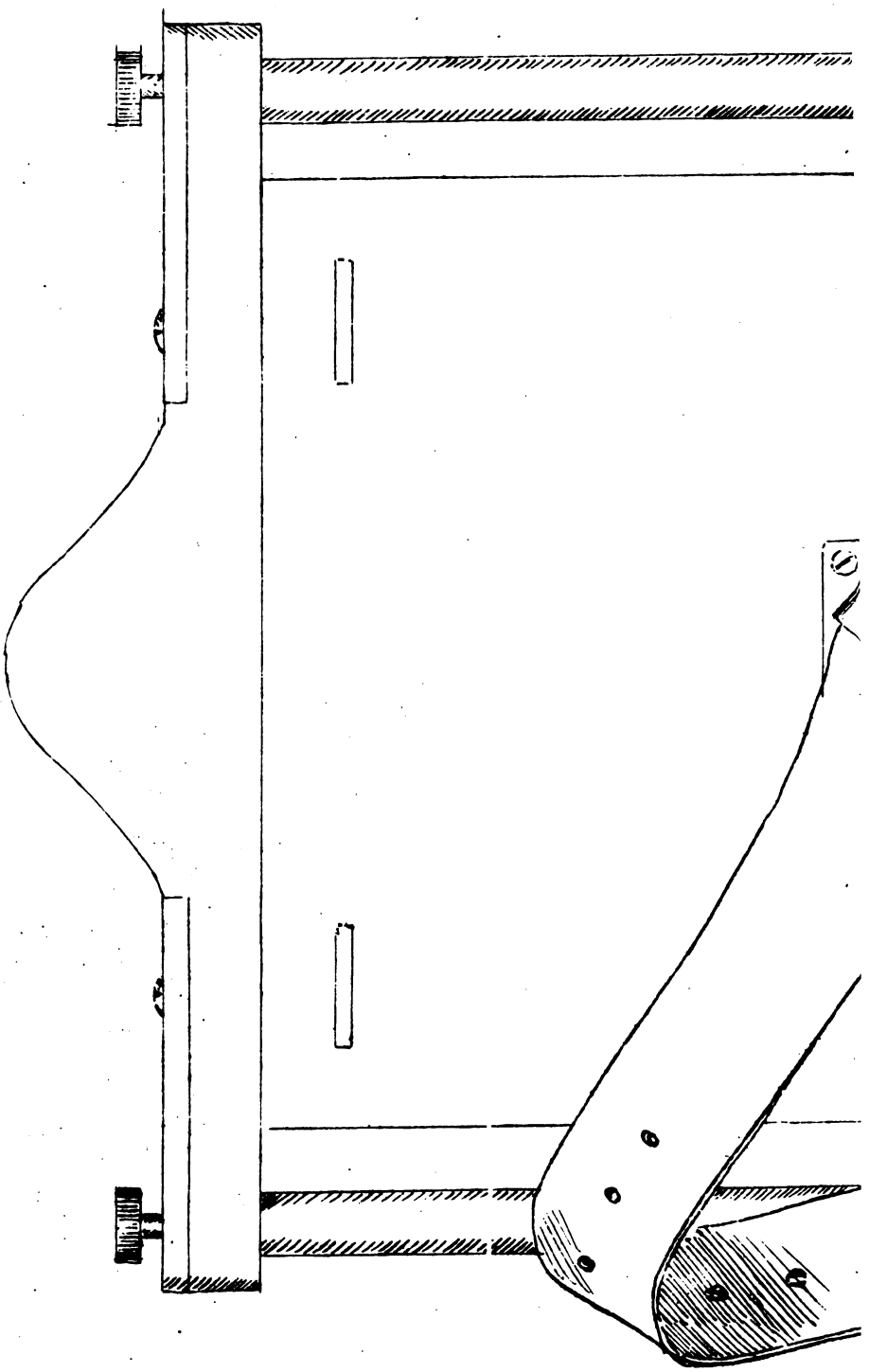
Besides this road-pencil, I would recommend the following articles to be carried for finishing up a sketch on the completion of the work in the field, *viz.*:—

A pen in a case with some spare nibs, not "crow-quills," but any fine steel pen; a small bottle of ink, of the "musketry register" pattern for choice, well corked up; a small box of chalks of the conventional colours, these must be really hard, and not like the soft chalks supplied to H.M. Stationery Office, which are worse than useless for this sort of work; a good penknife with two blades is an invaluable companion, and is best carried in the hold-all, where it is ready for use and not likely to be forgotten and left behind. As I have already said, the pen and ink may be replaced by a hard indelible pencil.

Now as to the paper; this should be smooth in texture and "hot-pressed," and should be cut in suitable lengths of 30 in. or so and 7½ in. in width, tightly rolled and tied up. Thus folded it will travel securely in the wallets or saddle-bags. If it is desired to take particular care of any sketches, an old busby-plume case forms an excellent receptacle.

The sketching-board, when not in actual use, can be conveniently carried strapped to the bridle arm above the elbow, where it will ride in safety out of the way.

The straight-edged ruler needs but little description. Any piece of wood will do, the best form being about 10 in. long by ¾ in. broad, and with bevelled edges, upon which the scale employed can be marked off in pencil from the scales engraved on the board. Messrs. Elliott have made me an excellent pattern



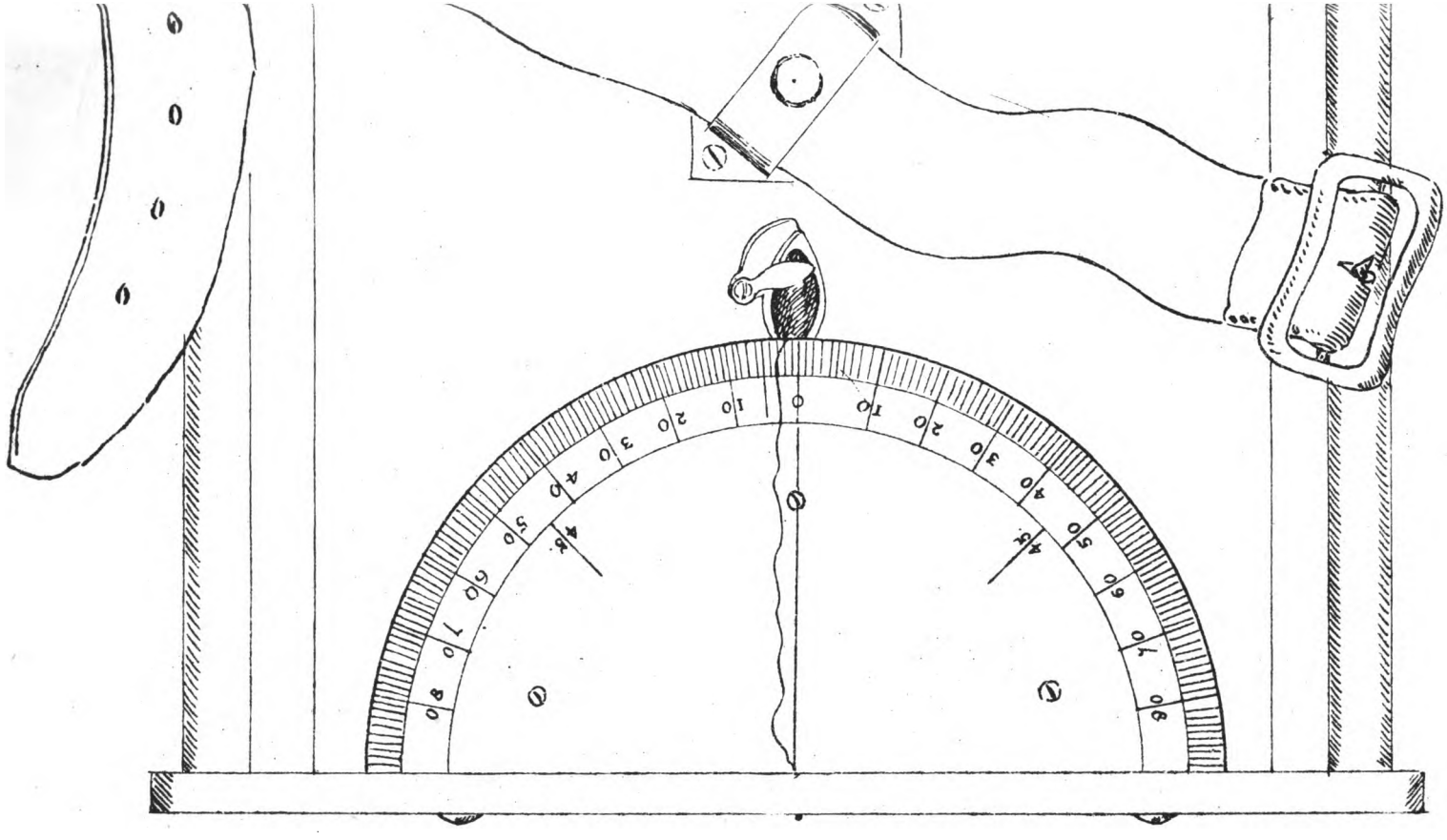


Fig. 9.—The Cavalry Sketching-Case (new pattern). Back View of Instrument.

weighted with a strip of lead along the centre; this prevents the wind from blowing it about when in the act of taking a direction with it.

In order to facilitate this process of noting a direction when mounted (and when one hand in consequence is occupied by the reins), it is customary to have a couple of indiarubber bands round the board, under which the ruler is slipped. For this purpose I recommend common white elastic, about $\frac{1}{4}$ in. wide, as being far preferable to the red vulcanite bands commonly used, and which catch the ruler, and are otherwise objectionable. The ruler can best be carried, when mounted, in the boot, after the manner of a Highlander's *Skene Dhu*, or it may be carried in the hand, but *never* in a shallow pocket or stuck under the bands on the board. Beginners affect both these latter customs only to find on requiring their ruler suddenly that it has been dropped perhaps a mile in rear.

I believe I have now described all the accessories for the work of rapid field-sketching, and I only trust that in attempting to do so I have not been considered as needlessly prolix by my readers. I have confined my remarks strictly to those points which experience has proved to me over and over again to be those upon which beginners are most likely to go wrong. In my next chapter I propose to deal with the method of working with the cavalry sketching-case.

CHAPTER II.

SKETCHING WITH THE AID OF MAPS.

The Two Branches of Field-Sketching.—The Advantages of practising Sketching with the Aid of Maps.—Method of setting the Working Meridian: (1) In the Field. (2) Indoors, before starting, with the aid of a Map.—The Line of Direction: How to approximately note its bearing.—Method of setting the Working Meridian, and at the same time ascertaining the bearing of the Line of Direction from a Map. Example: Hythe to Ashford, on 1-inch Ordnance Map.—How to adjust the Paper on the Rollers.—Preparation of a "Skeleton Route" from Hythe to Sellinge.—Notes made on it in the Field.—The Finished Sketch.—Example of an extended Reconnaissance Sketch with the aid of a Skeleton Route.

FIELD-SKETCHING may roughly be divided into two distinct branches, namely—(1) sketching *with*, and (2) sketching *without* the aid of maps. It is the custom for many men to summarize the first-named process as "cribbing" or "fudging," and to affect to look down upon work executed in this fashion. This, however, is absurd, and for the reason that, to obtain full advantage from a map, and to be able to rapidly and correctly seize upon and amplify the points affecting military operations requires an amount of practice, skill, and knowledge, which is probably quite beyond the understanding of those who condemn broadly "the use of maps." The main practical advantages of using a map are, firstly, the saving of labour caused by having the distances and directions already measured and noted; and, secondly, the excellent practice in map-reading, which is to be obtained by constantly referring to and verifying a map. It is a popular belief that every officer in the army is qualified to go abroad garnished with sketching paraphernalia, and is competent to make a sketch of anything, anywhere, "without the assistance of a map"; and, further, that the fact of his being able to do so stamps him as a man fit for his position. Every possible precaution is also generally taken to prevent officers using maps when employed in making military sketches. In this wild zeal to

cut away all chance of deriving assistance from maps, men are effectually prevented from becoming acquainted with their use. It is very certain that the vast majority are unable to execute a really useful sketch, and it is still more certain that for one man who may be required to *make* a map, a score are certain to require to *use* one. If, then, we make it our aim to teach men to work without maps, how are they ever to become experienced in using them? In the case of an army in the field, it is an undeniable fact, that nine times out of ten, a map of some sort or other is forthcoming, no matter what country even a British army may be operating in, hence the art of map-making is now-a-days far less important than the art of map-using, and I am profoundly convinced that the latter is an accomplishment which it would be a good thing to make more general in our service.

In other words, some sort of system should be introduced so that in the event of a man becoming possessed of a map of the country, he would know at once how to obtain the greatest amount of assistance from it. No matter how expert a sketcher an officer on a reconnaissance may be, if his whole mind and energies are taken up with the sustained effort of constantly keeping a record of his distances and of observing his directions in a hurry (in other words, with inaccurate surveying processes) he cannot be in a fit mental condition for rapidly grasping and noting all the points of tactical importance which are really the main objects of his work.

When talking about the assistance of maps, I do not refer to that sublime process of tracing the six-inch Ordnance maps, which is occasionally the preliminary stage of some military sketches, and in which fences and woods which have long since been levelled, roads which have been closed for years, and, lastly, "undefined" Parliamentary or parish boundaries which have never visibly existed, are all reproduced on paper in glaring relief.

My contention is, that on the good old rule that practice makes perfect, if it is to be insisted that men are always to work without maps, and if they really endeavour to do so, they will spend all their available time in what I have termed inaccurate surveying processes to the exclusion of everything else. Whereas, if they are provided with the data as regards distances, &c., which can be obtained from a rough map, and are permitted to devote all their energies to the tactical features of the ground, they are being trained in the truest sense in reconnaissance duties.

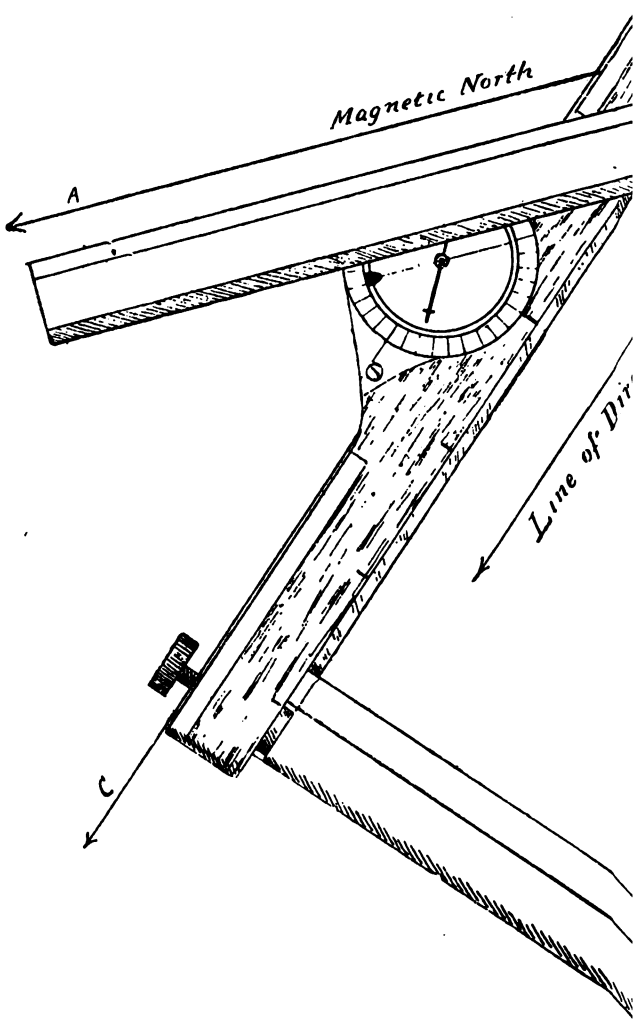
By providing them with these data, I mean nothing more nor less than by causing each man before he starts on a day's work to make an enlargement, in England from the one-inch Ordnance map, or abroad, from anything he can lay his hands upon, and with this as a basis, walk or ride along the route, fill in all the tactical features and write on the margin of his sketch any information he can obtain. By this means, in lieu of a sketcher being restricted to three or four miles on foot or eight or nine miles on horseback per diem, he can sketch and report upon double or treble that distance, and I maintain that a man's perceptions and faculties of observation are more rapidly and thoroughly trained by this process than by twice the amount of time occupied in painfully carrying out the already-named measurements.

Not only is this style of work excellent for instructional purposes, but it is one that is constantly applicable to real work in the field, and is in fact, the only rational method of conducting the complete reconnaissance of a line of advance in a civilized country, where maps would almost invariably be available.

On such occasions the maps would supply the distances and relative positions of towns, cross-roads, &c., whilst the reconnoitring officer on his enlarged map would note the state and width of the roads, the bridges, camping grounds, water supply, &c., and especially the tactical features, such as good advanced guard positions, favourable ground for outpost lines, for holding the enemy in check, or which, on the other hand, would be advantageous to the enemy should he occupy them.

It must be plain to everybody that this class of information, if given on a fairly accurate map such as an enlargement, would be far and away more useful and easy to grasp than a mere written summary or description of the country traversed, and it is very obvious that if any given reconnaissance were carried out with reasonable rapidity it would be absolutely impossible for the most expert sketcher, unless he were provided with a skeleton route, to keep up with the troops thus engaged. Hence the necessity for a system of "sketching with the aid of maps."

Before entering into any detailed instructions with regard to sketching either with or without the aid of maps, it will be necessary to explain fully the methods of setting the cavalry sketching-case by means of the working meridian. This process has already been briefly alluded to in the first chapter. I now pro-


Magnetic North
A
Line of Dir
C

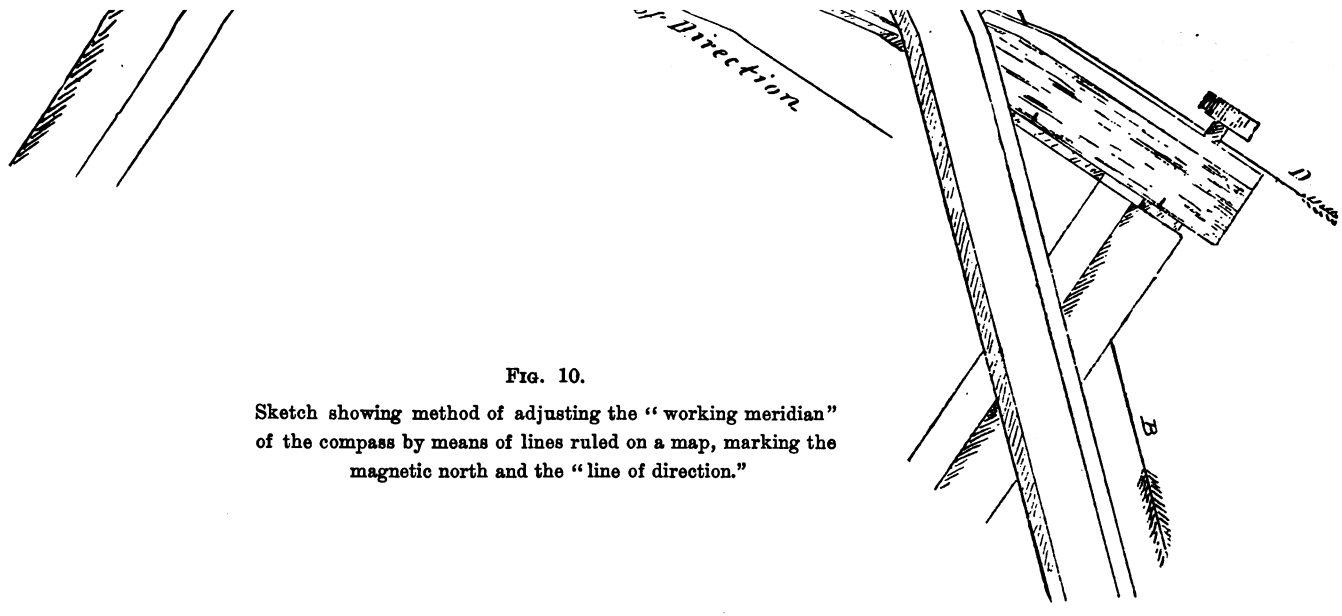


FIG. 10.

Sketch showing method of adjusting the "working meridian" of the compass by means of lines ruled on a map, marking the magnetic north and the "line of direction."

pose to discuss the matter at length, since the degree of ease and accuracy with which any work can be executed depends in a great measure on the careful adjustment of the compass. Of course, when sketching without maps the whole operation is dependent upon the compass, but it is also very obvious that it will be an immense assistance to a sketcher who is working with the aid of a rough map fixed on his board, if the working meridian be so adjusted that he can "set" this map at any required instant.

This adjustment of the meridian had best be done before starting, but it can also be done in the field when opportunity offers. For the latter process, it is necessary to note some well-defined line, such as a straight bit of road or railway, or to observe the direction of any prominent object from the position of the sketcher (both of which points must be recognizable on the map), and to "set" the board in its relative position to the ground by laying the straight edge on the observed line on the map, and turning the latter until the ruler is found to be aligned in the direction of the objects themselves. The working meridian is then set by turning it round until it coincides with the magnetic needle, and the board can be similarly set at any subsequent time by revolving it on its pivot.

A good way of setting the working meridian by means of the map before starting, provided the magnetic north has been given or marked off by means of the protractor, is to rule a line indicating the magnetic north, as AB in Fig. 10, and another showing the general direction of the route we wish to follow, as CD, and which I will call the "line of direction."

Since the longer graduations on the compass ring, as at EE^1 in Fig. 11, are truly parallel to the head-piece and foot-piece—that is, to the line of direction—it is convenient to always regard these as marking the general line to be followed. The sketching-case is now laid on its back, with the outer edge of the head-piece, as in Fig. 10, along the line of direction CD, the working meridian is then adjusted parallel to the line representing the magnetic north, by means of the eye, aided by the straight edge laid across the compass. Care should be taken that the end of the working meridian intended to be on the north side be placed there, as shown in the figure.

This being done, it is evident that the board can be set at any time by revolving it on its pivot until the magnetic needle coincides with the working meridian, as in Fig. 11. The bearing of

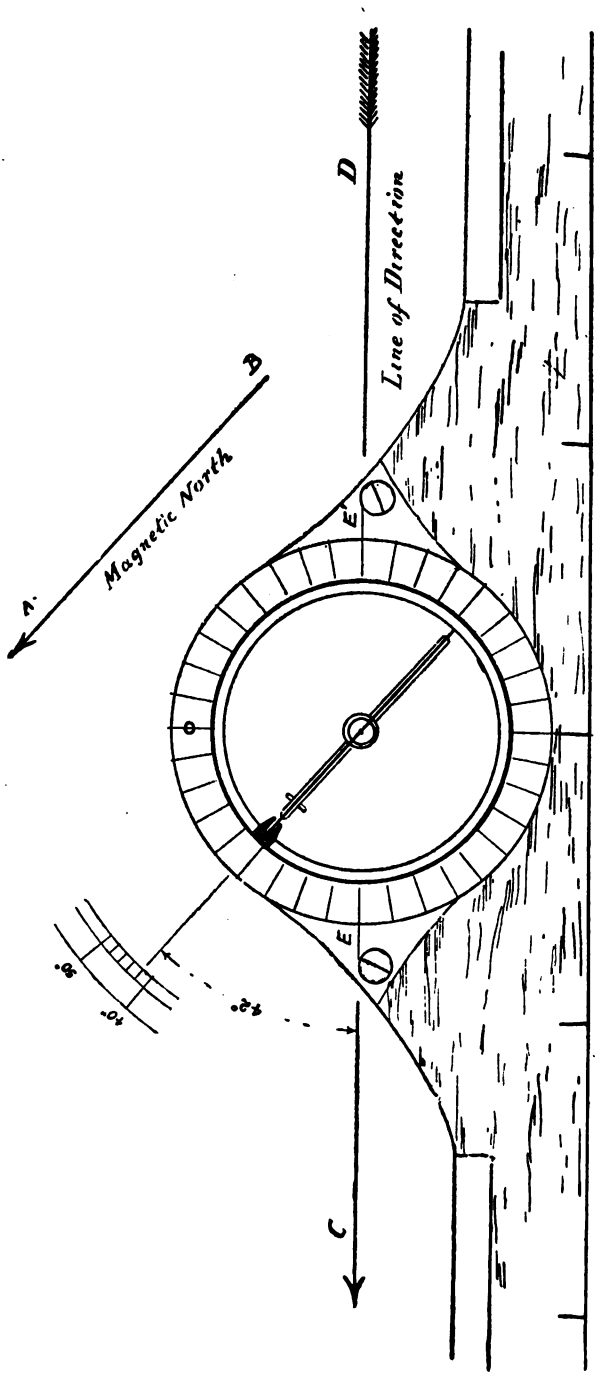


Fig. 11.—Sketch showing graduated compass ring, with method of adjusting the "working meridian" and magnetic needle for a bearing of N. 42° W.

the line of direction can be *approximately* noted from the graduated compass collar to be a little over 40 degrees west of magnetic north (see Figs. 10 and 11).

It will be noted that the foregoing process starts with the assumption that the magnetic north is given or can be accurately protracted and laid down on the map. This would generally be the case, but in the absence of a protractor the one on the sketching-case could be utilized. Perhaps, however, the most accurate method of setting the working meridian and, at the same time, ascertaining and recording the bearing of the line of direction, is to lay the sketching-case on its face, with the edge of the foot-piece along that margin of the map which happens to be most convenient for the purpose. The angle which the "line of direction" makes with the margin can then be noted by means of the protractor screwed on the back of the board, the eye being guided by the ruler laid across it as shown in Fig. 12.

This figure gives a rough representation of the upper portion of Sheet 305 of the 1-inch Ordnance Survey, on which I have marked the position of Hythe and the line of direction from that town to Ashford, also the main road and railway. In this instance it is most convenient to adjust the sketching-case along the top or north edge of the map, as shown in the figure, and it will be seen that the angle made by the line of direction with the margin is about 30°, that is to say, 30° south of true east, which is equivalent to 60° west of true north, or allowing 18° for magnetic variation, we get 60–18, that is, 42° west of magnetic north, or N. 42° W.

This, then, is the "bearing" of our line of direction when proceeding from Hythe to Ashford, and the working meridian should be adjusted as before, a shade over the fourth graduation to the right of E in Fig. 11, thus marking the position the needle will occupy when the board is "set."

The preceding process, although somewhat troublesome to describe, is in practice a very simple matter which can be learnt in a moment from actual experiment with a map and board. The annexed diagrams (Figs. 11 and 12) will sufficiently explain what is meant. The process, like most of the others with the cavalry sketching-case, is a little rough and ready, but I have found from practice that it is perfectly easy to ascertain the magnetic bearing of any "line of direction," and to adjust the

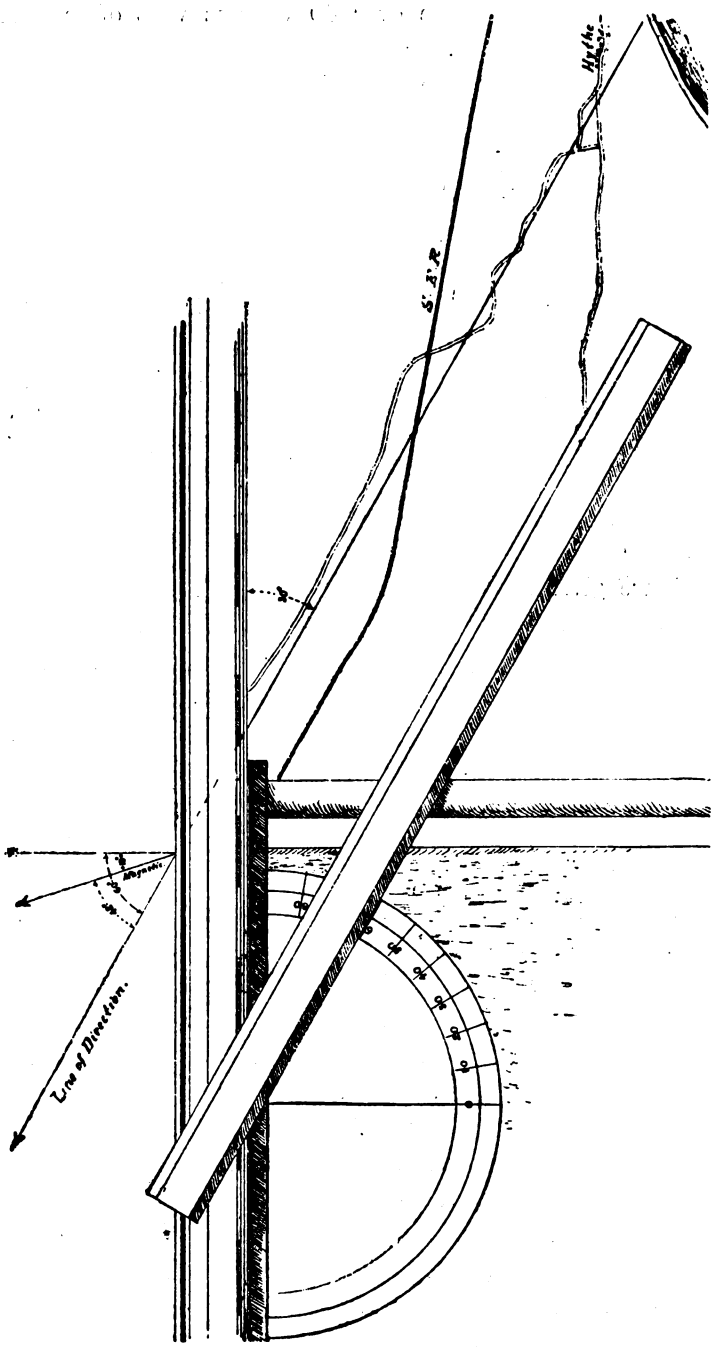


FIG. 12.—Sketch showing method of ascertaining the magnetic bearing of the "line of direction" on a map. The sketching-case has been drawn somewhat to the left of the position it should be in, for the sake of clearness.

working meridian in this manner, with *sufficient* accuracy for the work in hand.

It is a good precaution to note on the sketch before commencing work, the magnetic bearing of the "line of direction" thus, "N. 42° W." The object of this is, should the position of the working meridian be accidentally altered or the sketch be taken off the board before the magnetic north has been marked on it, it is easy to ascertain the latter. An almost equally good plan is to rule a line on the sketch to mark the position of the working meridian.

In order to make it clear to my readers what I mean by sketching with the aid of maps, we will suppose that it is desired to make a reconnaissance of the road from Hythe to Ashford, and that no instruments are available beyond a cavalry sketching-case, also that we are provided with the one-inch Ordnance map. It will be sufficient for my purpose if we take the first three miles of the road from Hythe, and annexed is a rough copy of that portion from the one-inch map, (Fig. 13). I may mention here that the great difficulty which presents itself when using one of these maps for deciding on any particular route, is the impossibility of determining from an inspection of them which roads are metalled, and which are merely grass tracks or disused bye-roads, unfit for the movement of troops on the march. If the rough copy be compared with Sheet 305, it will be seen that a mass of detail has been omitted, and the roads merely given as they appear, and yet, as will be shown presently, only one of these roads is really fitted for the movement of any considerable number of troops.

The first thing to be done is to rule a line on the map from Hythe to Ashford. This will give us the general direction we wish to follow, that is the "line of direction"; next draw lines parallel to it on either side at a distance of one inch, and lines at right angles across these three, also one inch apart. The map will now be divided into one-inch squares as shown, and it is almost unnecessary to say that this can be done with the aid of the straight edge, and the graduated foot-piece of the board.

We will assume that we wish to make a report and sketch of the road on a scale of three inches to a mile; since the distance from Hythe to Ashford is about ten miles as the crow flies, we take a strip of paper about 36 inches in length, and as wide as the board will carry, viz. 7½ inches, and rule a line right along

its centre, and others parallel to it on either side at a distance of three inches. The paper is now placed on the board as follows: one end is inserted into the narrow slit in the roller, and the paper wound round it so as to take up as much as may be required, this roller is then clamped by a turn of the screw, and the other

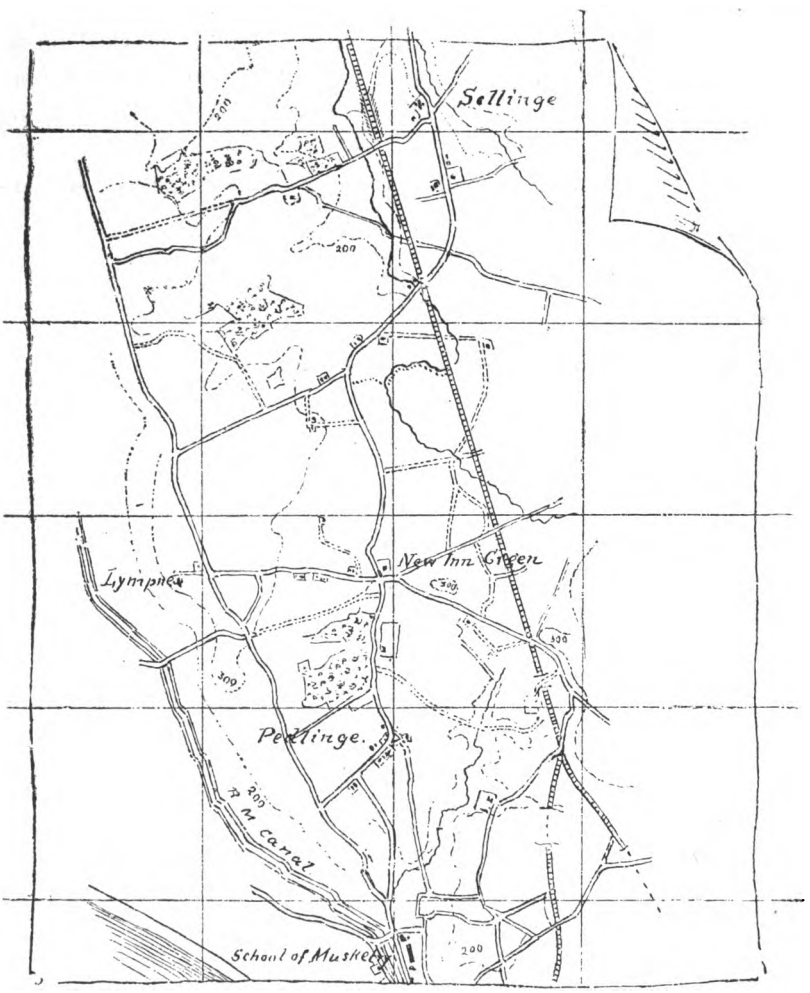
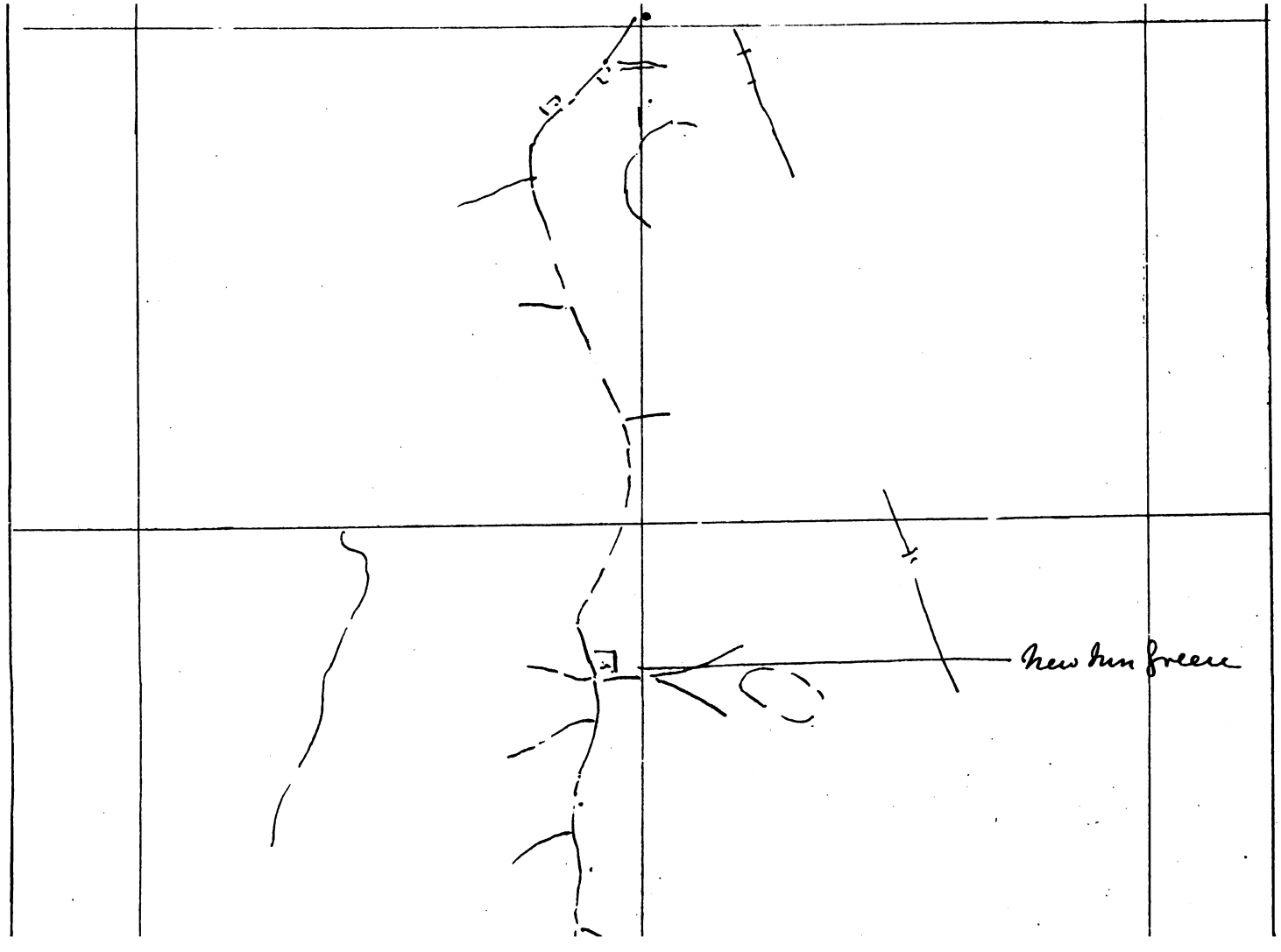


FIG. 13.—ROUGH SKETCH REPRESENTING ONE-INCH ORDNANCE MAP.
With divisions of one inch square.

end of the paper inserted in the opposite roller and wound round it, and as soon as all the slack paper is thus taken in, also clamped. It will be found a good plan to have the ends of the paper clean cut with a sharp knife and the corners turned down and pressed flat so as to facilitate the process of attaching them to the rollers.


New Hampshire

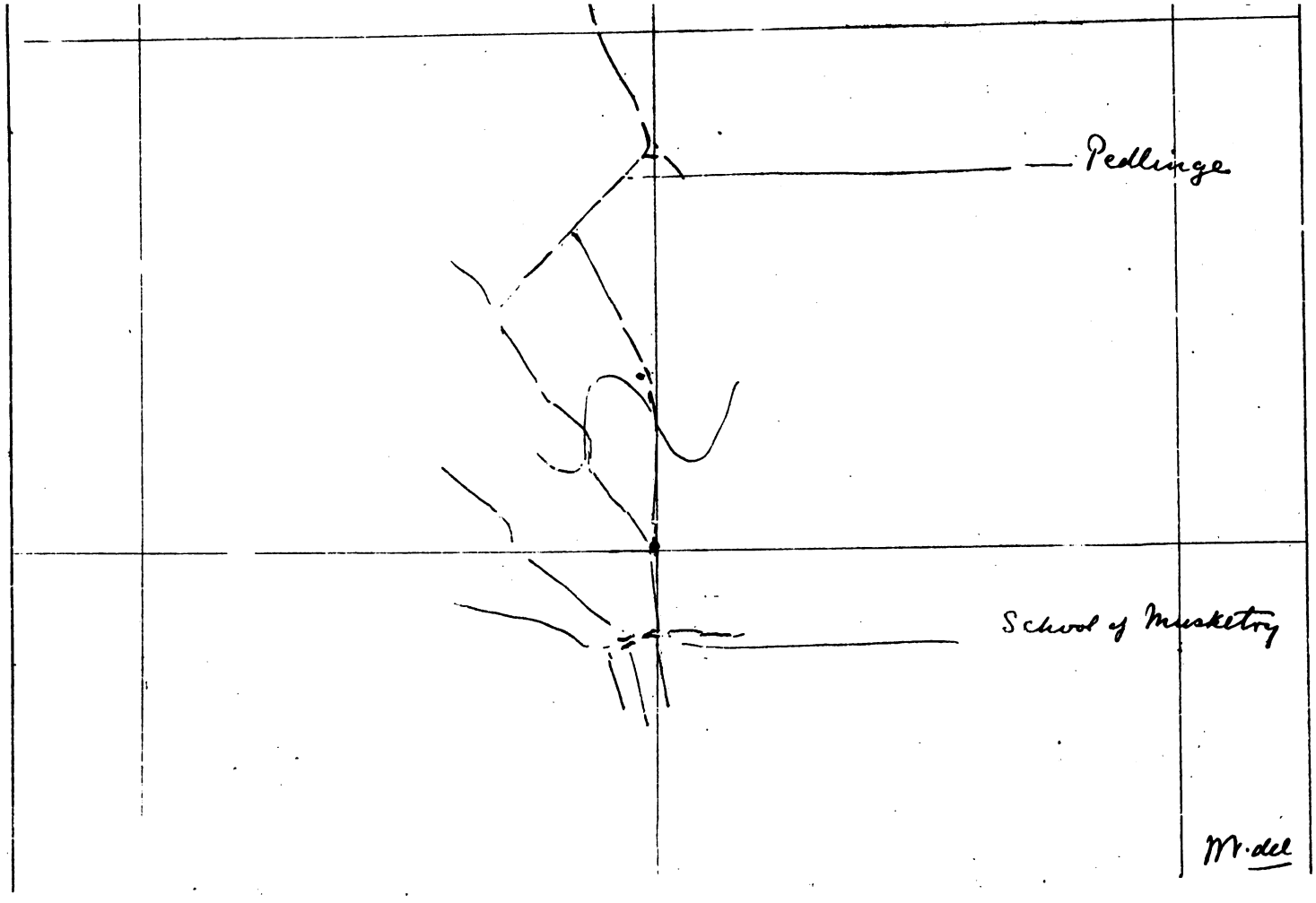


FIG. 14.—Sketch showing Skeleton Route of Road from Hythe towards Ashford, enlarged from 1-inch Ordnance Map at a scale of 3 inches to a mile.

Care must also be taken that the ends are inserted truly square, so as to ensure the paper lying flat on the board. This is easily done by adjusting the edge of the paper lengthways, parallel to the head-piece or foot-piece, before commencing to roll it up.

The paper is now on the board, and should be "overhauled" on the rollers until the bulk of it is on that roller which lies on the side of the board towards which we propose to work, in the present case on the Ashford side. The three-inch squares are completed by laying the ruler across the board between the graduations on the head and foot-piece, and ruling lines at every third graduation.

We now have our one-inch Ordnance map divided into one-inch squares, and the paper on our board divided into three-inch squares, and with a little care and judgment it is an easy matter to rapidly transfer the general direction of the road, and the positions of cross-roads, villages, or conspicuous points on an enlarged scale from the one-inch to our three-inch map. Here, again, a good eye for drawing comes into play and enables a man to rapidly estimate whether a road cuts one side of a square in the middle or at one third, one quarter, or less, of its length.

Annexed is an enlargement (Fig. 14) supposed to be drawn with a hard pencil such as an H or HH, and which gives an exact facsimile of the skeleton route enlarged from the one-inch map, as it appears on the cavalry sketching-case *before* starting on the reconnaissance of the road.

In all mounted work with the sketching-case where distances have to be accuratety measured it is necessary to construct careful scales of the paces of one's horse, and mark them off on the ruler carried. In the present instance as we are dealing with the simplest form of sketching, with the aid of an enlargement from a good existing map, I shall not complicate matters by referring to these scales. All then that is required is to mark off a certain number of "hundreds of yards" at a scale of 3″ to a mile on the ruler, and to bear in mind that an ordinary horse covers about three yards of ground every time the rider rises in the saddle when at a trot. The object of this is, if any small detail has to be added to the enlarged map, its distance can be approximately measured from some known point by counting the number of "trots."

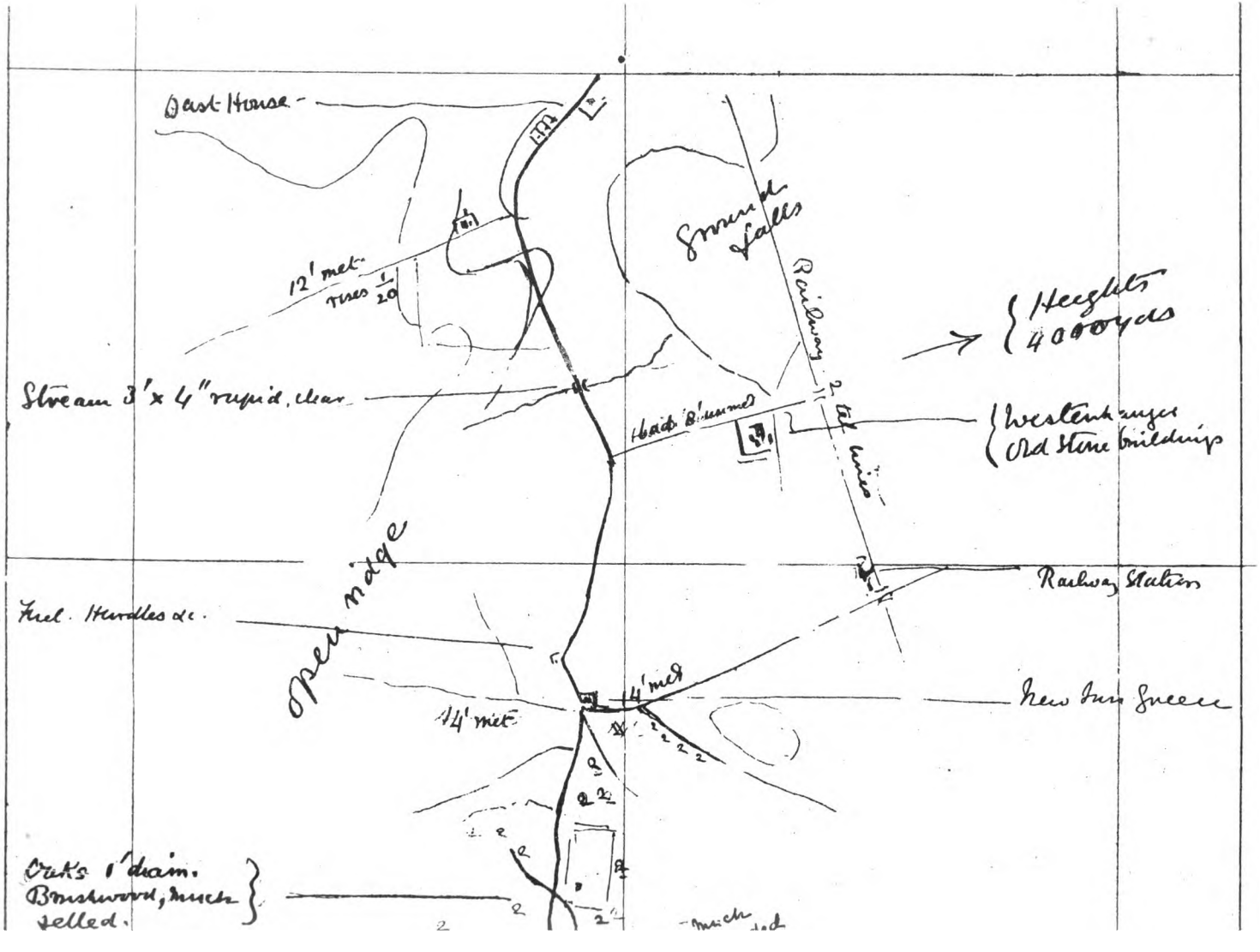
In marking off the yards on a ruler, it is always well *not* to number them, but to mark off a good number of "hundreds" all

along it so that at whatever point it may be adjusted on the sketch, it is easy to count from it. We will now start on our ride, the sketching-case strapped on the left wrist *over* the sleeve, the ruler stuck in the right boot, and the pencil in the hand or hold-all.

Commencing at the cross road at the west end of the School of Musketry, Hythe, we note on the margin of the sketch, the width of metalled portion and the condition of the roads; the length, width, span, height, and construction of the bridge across the canal at that point, &c. &c. The gradient of the road and bye-roads is also noted on the sketch, and the stream by the road-side looked at with an eye for "watering arrangements." The fact that the heights about Pedlinge command the road is noted. The general gradient of the road followed is about $\frac{1}{15}$. The scale of horizontal equivalents for 30 ft. contours at 3″ to a mile, being engraved on one of the metal shoulder-pieces of the board, can be marked off on the ruler or transferred by eye to the sketch with a little practice. The hill leading to Pedlinge is about 1,200 yards long, and since with a gradient of $\frac{1}{15}$ there is a contour every 150 yards, we get a rise of about 8 contours or 240 ft. The crest line is drawn in by eye as shown, and turned on either side so as to give the idea of a road going up a ravine-head. The latter part of the road ascends at a gradient of about $\frac{1}{30}$. Arrived at the cross road it is seen that the ground to the south rises for about a quarter of a mile at the same slope, hence another contour is put in to denote the top of the hill and any necessary information marginally noted. Our road now turns sharp to the north and enters a cutting, at the end of which lies the small hamlet of Pedlinge.

We note that Pedlinge itself is of no great tactical importance; but the ground around it is commanding, and an advanced-guard holding the village could offer some resistance to a force approaching from the north. The general nature of the country, however, is much intersected, and there would be considerable danger from out-flanking enterprises on the part of the enemy.

The rest of the sketch and notes are carried out on precisely the same lines, a comparison of the three stages will explain the way it is done better than writing. Fig. 15 shows the "skeleton route" which has served as our guide along the road and on which we have drawn in some detail and made various notes. Fig. 16 shows the sketch when cleaned


East House
12' met.
Trees 1/20
Ground falls
Railway
Heights 400 yds
Stream 3' x 4" rapid, clear
Head B'mmed
Western ranges
Old Stone buildings
Open ridge
Railway Station
Fuel. Huddles &c.
14' met
14' met
New Inn Green
Crks 1' drain.
Boustwood, much felled.

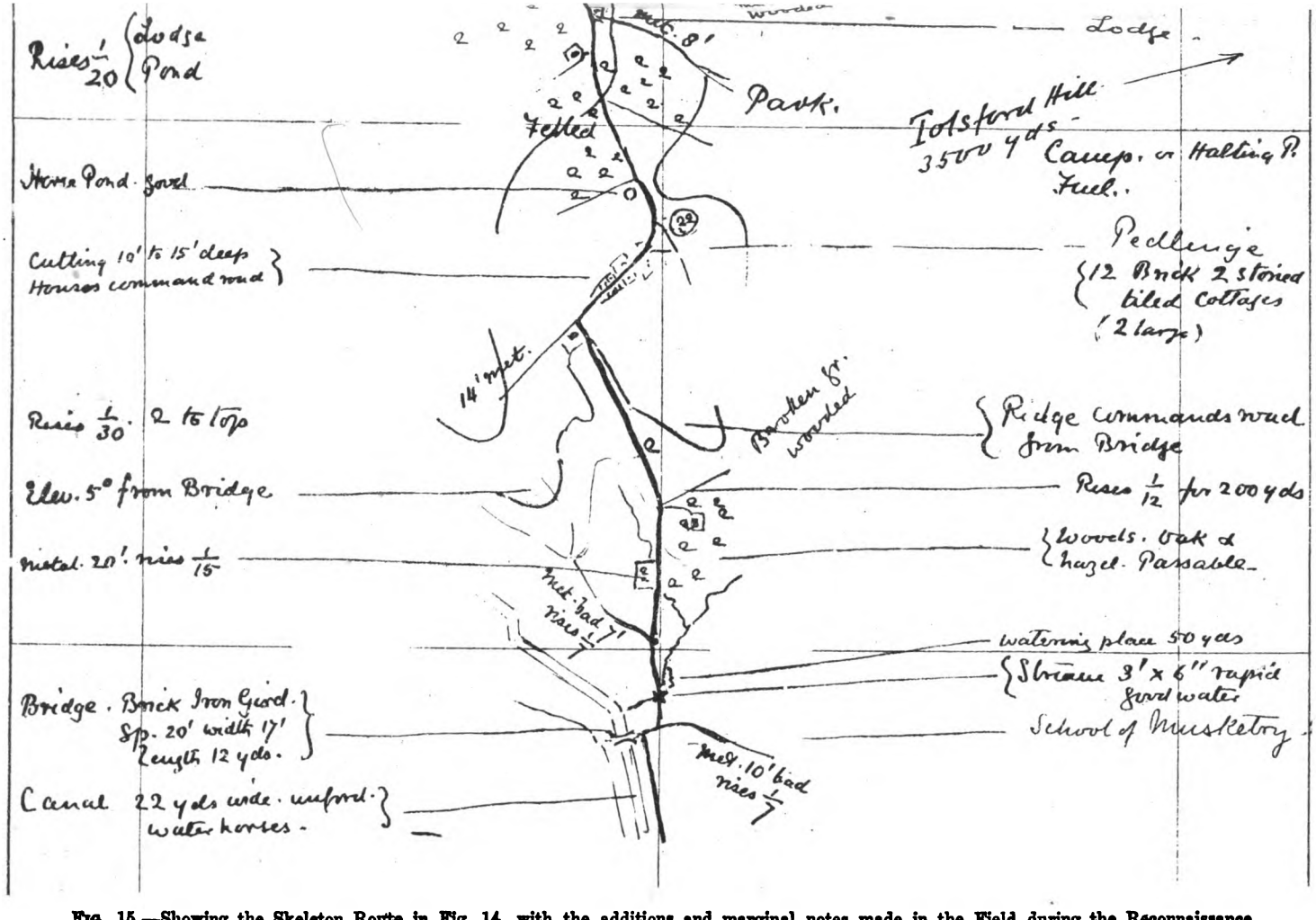
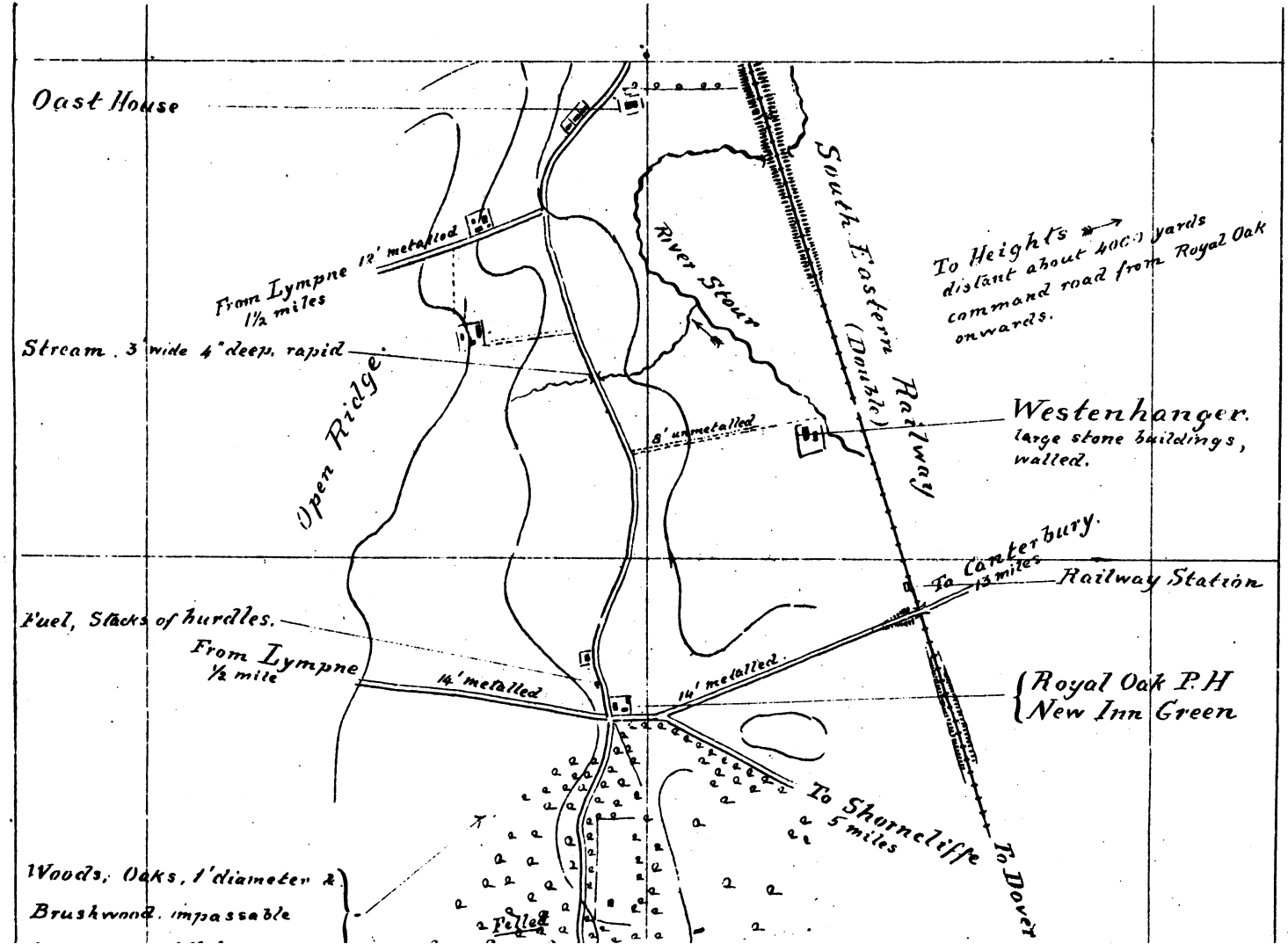


Fig. 15.—Showing the Skeleton Route in Fig. 14, with the additions and marginal notes made in the Field during the Reconnaissance.


Oast House
From Lympne 12' metalled 1½ miles
Stream. 3' wide 4" deep, rapid
Open Ridge
River Stour
South Eastern (Double) Railway
To Heights ➝ 4000 yards distant about command road from Royal Oak onwards.
8' unmetalled
Westenhanger.
large stone buildings, walled.
To Canterbury.
4a 13 miles
Railway Station
Fuel, Stacks of hurdles.
From Lympne ½ mile
14' metalled
14' metalled
Royal Oak P.H
New Inn Green
To Shorncliffe 5 miles
To Dover
Woods, Oaks, 1' diameter &
Brushwood. impassable
Felled

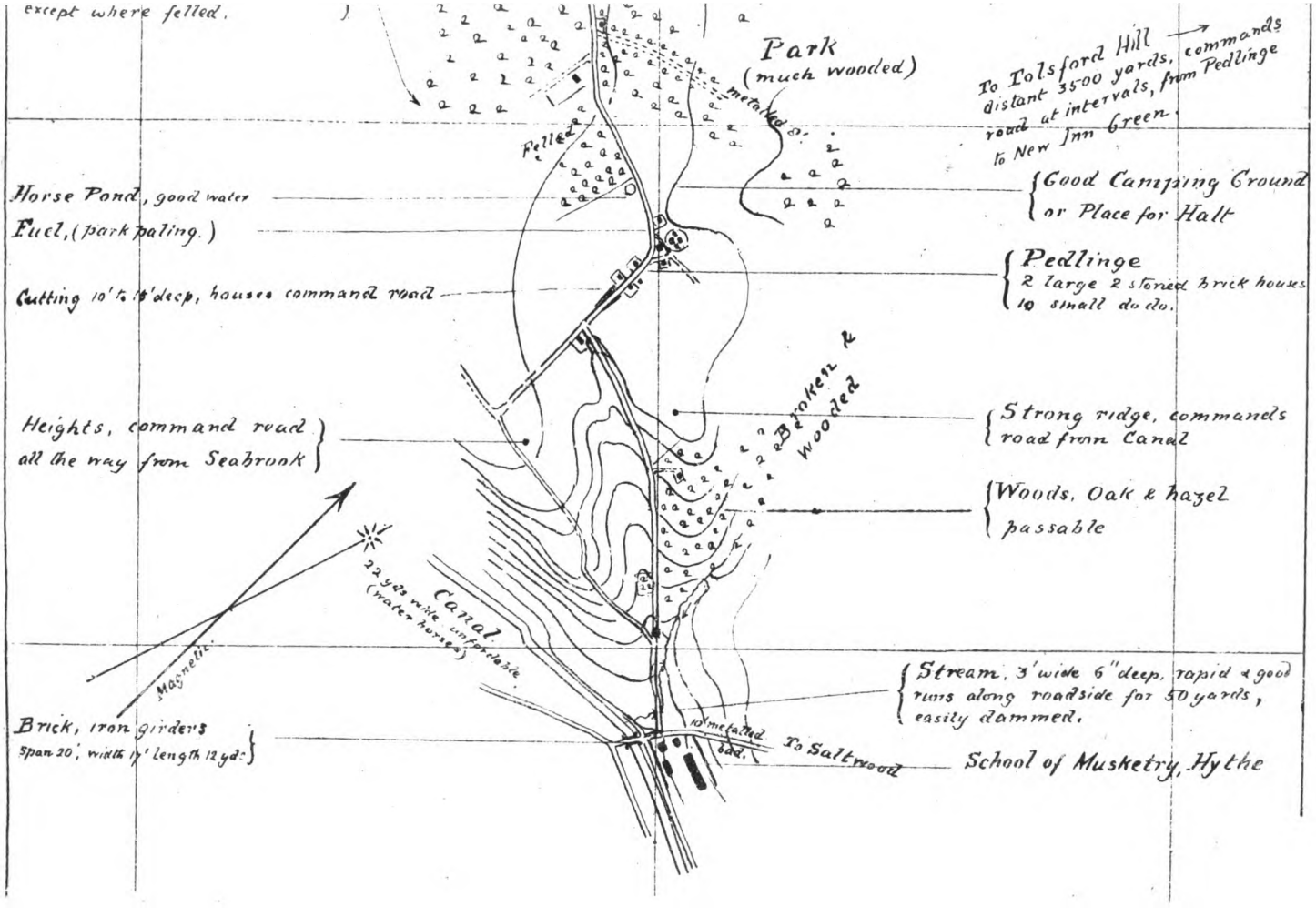


Fig. 16.—Showing the Skeleton Route in Fig. 14, "finished up" from the notes made in Fig. 15.

up and generally "worked out" from the notes on our return from the reconnaissance. The last is not to be taken as a model of what can be done in this line, since it is far from being an accurate or full reconnaissance of the portion of the ground in question; but it has at least the merit of being a fac-simile of the original sketch done against time, and not since corrected. As such, I believe it to be more useful as an example of this class of work than if it had been worked up to a high state of perfection indoors.

As an example of what can be done by trained men in the way of sketching with the aid of maps I will briefly here describe a reconnaissance which was carried out in the South-Eastern District last year by a small party of cavalry, consisting of 1 officer and 6 non-commissioned officers and men of the 14th Hussars. One of the latter led a spare horse which, however, was not wanted, as events turned out. Each man, who had been previously thoroughly practised in sketching in this manner was provided with a hektographed skeleton-route of the road from Folkestone to London at a scale of two inches to a mile, and a cavalry sketching-case upon which each section of the road was fixed, as required.

The "general idea" was that of an officer's reconnoitring patrol, such as would be sent out on active service by the general commanding the cavalry covering the advance of an army from Dover on the Capital, with the object of reporting on the road and general nature of the country, and more especially noting the points of tactical importance, such as advanced or rear-guard positions, favourable outpost lines, &c., &c.

The orders were to reconnoitre, as far as possible, towards the Capital and to return with all speed with the information obtained to Shorncliffe, where head-quarters were supposed to be established.

We left Sandgate (one mile west of Folkestone) at 6 A.M. on 28th March, and sketched and reported on the road to Maidstone, *viâ* Ashford, a distance of about thirty-three miles, arriving there at 5 P.M.

On the following morning we left Maidstone at 7 A.M. and reconnoitred, *viâ* Wrotham, Farningham, and Eltham, up to Woolwich, about twenty-eight miles, marching into that place at 5 P.M. The average rate, including halts, was thus about three miles an hour.

In accordance with the "special idea" of the reconnaisance we

started on our return journey next morning at 7 A.M., passing through Maidstone at noon, Ashford at 4.30 P.M., and reached Shorncliffe at 7 P.M., having been exactly twelve hours on the road. Two halts of an hours apiece were made, dividing the journey into three twenty-mile stages. Now, although in this instance some of the men produced most excellent and useful sketches of the whole sixty odd miles, I do not advocate such forced marches except now and again as an experiment, so as to give some data to go upon, should the necessity ever arise.

In an enclosed country like the county of Kent, I believe that twenty miles a day is quite as much as any ordinary skilled draughtsman is able to sketch and report upon with any degree of comfort combined with accuracy, and such "forced marches" as thirty-mile reconnaissances are no doubt a great mental strain on the majority of men. Still it is a good thing to know that thirty miles and more per diem *can* be done upon an emergency.

Particular stress has been laid on the fact that the return journey was effected on the day following the ride to Woolwich since the essence of all such rapid sketching as I advocate is that the information thus obtained should be placed at the disposal of the authorities with the least possible delay. No time should be given for the adornment of the sketches or for the compilation of long reports. At the end of each day's ride, the sketches should be cleaned up and all information obtained *written upon them*, and if time permits, a brief summary of the more inportant points noted in the day's work should be tabulated on a half sheet of foolscap and attached to the sketch.

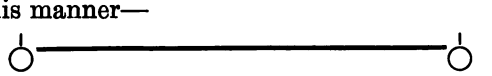
Whether twenty or thirty miles of road are reconnoitered in a day, it is evident that the ordinary form of Road Report is quite out of the question, since it would take hours to compile, and even when compiled, be so bulky as to be useless for rapid reference. Further, information gathered in these rapid reconnaissances is of far too general a nature for such detailed reports as are usually furnished on "Army Form, K. 1305." The work of making and compiling these useful road itineraries would as a rule be performed by parties detached from the army, whose front was covered by the cavalry screen with which our more rapid reconnoitrers are assumed to be moving. These detailed reports, besides entering into all the *minutiæ* usually required of them, might also give statistics as to supplies, &c., all of which information is clearly beyond the scope of rapid reconnaissance work.

I am not at all settled in my own mind as to how much the brief reports advocated should comprise, but acting on the principle that any specific orders as to the information to be obtained on a reconnaissance should be specifically carried out; on the occasion of the Woolwich ride the form of report given below was adopted. It should be mentioned that the road was divided for convenience of sketching purposes into four sections of about fifteen miles each, and to each of these sections was attached a half sheet of foolscap with a brief report as follows :—

	SECTION III. MAIDSTONE TO KINGSDOWN.		Miles from Maidstone.
1	Positions commanding the Line of Advance.	(1) High downs north of Addington and Wrotham.	9
2	Advanced Guard Positions and favourable Outpost Lines.	(1) Wrotham Heath. . . . (2) Chimham Farm, Kingsdown.	8 14
3	Halting or Camping Grounds.	(1) Ditton . . . . (2) Addington Park . . . (3) Half mile S. of Wrotham .	3½ 6½ 8½
4	Causes to delay rate of Marching.	(1) Hill out of Maidstone, rises $\frac{1}{20}$ for 800 yards. (2) Hill, Wrotham to downs, rises $\frac{1}{15}$ for 1,000 yards.	0 9
5	General Remarks.	For 7 miles from Maidstone, country much wooded and broken. From Addington to Wrotham the downs command country adjacent.	

March 29th, 1887. (Signature) Rank and Corps.

Besides giving all possible information on the sketch itself by marginal notes after the manner already described, we, as it were, emphasized the important points enumerated in paragraph 2 of the Report by drawing a line in coloured chalks across each position in this manner—



By this means it is made easy for every person opening the map for the first time to rapidly pick out those positions where *some* sort of a view and field of fire are to be obtained, such localities being by no means common in an enclosed country like Kent.

In conclusion, I wish to say that I am far from believing that this style of report has any especial merits; it is merely given as an example of what has been done.

CHAPTER III.

SKETCHING WITHOUT THE AID OF MAPS.

The Necessity for constructing Scales.—How to ascertain the Paces of a Horse.—To what extent Sketching on Horseback is accurate.—How to construct Scales (1) of Trots, (2) of Walks, (3) of Canters.—Preparation of the Straight-edged Ruler.—How to observe Directions.—How to do so rapidly.—Fixing the Positions of Distant Objects.—How to proceed when the Sketch "runs off the board."—Keeping a Record of a Horse's Paces.—Sketching by the average Rate of the Horses of a Detachment.—The Paces of Horses.—Example of a Reconnaissance carried out on this System.—The use of a common Foot-rule as a ready-made Scale.—Table of Trots and Walks for use when a Foot-rule is employed.—General Rules for Sketching with a Foot-rule under all circumstances.

In my last chapter I dealt with sketching with the aid of maps; I now propose to take my readers into the more advanced processes of map-making without any such aid. I fear that some will be not too pleased to hear that before anything can be done in this line it will be necessary to wrestle with one of those objectionable articles called "a scale." It is a curious fact that many men have an innate dislike, and, I might add, a suspicion or distrust, of these unfortunate necessities in surveying; but since they are necessities I must ask those who have this failing to try and overcome it for the present time at any rate, whilst I endeavour to explain what "scales" are required for sketching on horseback.

Now, it is plain that if a horse's paces be taken as the units for the measurement of distances in the execution of a sketch, it is necessary that we should be provided with a scale of these paces *on the scale we propose to work upon*, that is to say, on a scale of 2″, 3″, or whatever we require, to a mile.

In other words, we must ascertain the number of "walks," "trots," and "canters" the horse we are going to ride when sketching, takes to cover a measured distance, and having done so, construct scales to represent hundreds of these paces on the scale we have elected to employ. In counting "walks" it is easiest to count "two" each time the near fore-foot is brought to the

ground: thus, 2, 4, 6, 8, and so on. In trotting, each "rise" in the saddle is counted as a "trot," and in cantering, each time the leading foot comes to the ground is reckoned as a "canter."

In every case it is necessary that the horse should be made to go at its natural pace, *i.e.* not too fast, this especially applies to trotting, which is the pace at which nearly all the work is executed. If a scale of canters is required, the horse should be kept well in hand and cantered at a steady pace such as would ordinarily be employed if a short stretch of turf along a roadside gave one an opportunity of breaking into a canter. But unless a man is working by himself and riding a horse he thoroughly knows, I do not advocate the employment of a scale of canters at all, for if used unskilfully, it is a fertile source of error.

In order to ascertain a horse's paces with accuracy, it is best to ride along the measured distance several times, and take the mean of the paces thus noted as the correct number.

Experience has taught me that it is as well to make these trials on undulating ground, since a truer idea of the average paces of a horse are thus obtained than when the ground selected is a dead level.

We will assume that a measured distance of 400 yards, say from A to B, has been marked off on an undulating piece of ground, and that we have trotted the horse we wish to work with, three times along it with the following result:—

1st trial (A to B) 125 trots.
2nd trial (B to A) 129 ,,
3rd trial (A to B) 127 ,,

Adding these together we get 381, which number divided by 3 gives us a mean of 127 "trots" for 400 yards, that is to say, about 560 "trots" to a mile.

The other paces, "walks" and "canters," are ascertained in a precisely similar manner, the average number being taken in each instance. We will suppose these to be 436 walks or 120 canters to 400 yards. In order to become thoroughly acquainted with the paces of a horse, besides these trials over a measured distance of 300 or 400 yards, it is a good plan to trot along a measured mile, say between two milestones, and also during a day's ride to make various notes of the number of paces along certain sections of the road which can be identified on the 6-inch Ordnance map subsequently.

Wishing to satisfy my own mind as to whether the number of "walks" per mile of a horse remained constant under all ordinary circumstances, I kept a record five times of the number of "walks," along various measured distances up to 600 yards. Reducing these to the number of "walks per mile" I obtained the following results:—

1st	trial,	rate of	1,917	walks	per mile.
2nd	,,	,,	1,923	,,	,,
3rd	,,	,,	1,913	,,	,,
4th	,,	,,	1,920	,,	,,
5th	,,	,,	1,927	,,	,,

The mean rate of the above will be found to be 1,920, and I think it will be admitted by all who try a similar experiment, that the pace of a horse at a walk is very fairly constant, and that anybody using these "walks" as a record of distances traversed, would find his work almost absolutely accurate. Similar trials at a "trot" have proved the same fact. It is doubtful whether the most skilful surveyor, thoroughly practised in pacing yards, could ever equal the accuracy of any horse's paces, and it is certain that the ordinary sketcher (who is only too pleased if he can pace 100 yards with an error of not more than 5 per cent.) is hopelessly out of it when his paces are compared with the mechanical regularity of a horse's.

I have laid particular stress on this point as it is a common error for the uninitiated to assume that sketching on horseback is what they term "awfully inaccurate." So far as regards *distances*, it has been shown to be far more accurate than pacing on foot. Where inaccuracy at times comes in, is in the observation of *directions*, and it is obvious that with the limited means at the disposal of the sketcher for such operations and the unsteady nature of the "platform" he is working upon, it is impossible to look for absolutely correct observations. But, on the other hand, it may be fairly argued that taking into consideration the nature of the work performed on horseback, in most cases it is not absolutely essential that the directions should be more than approximately correct, and the truth of this is, I think, thoroughly borne out in practice, for given, say, a road-sketch on which the distances were correct, not one man in a thousand would know, or if he knew, would care, whether the direction of the road were a few degrees out of the true bearing or not, and it certainly would not

affect the value of the map in the least. But should it be of vital importance to ascertain the bearing of any object with the greatest precision possible; by dismounting and laying the sketching-case on the ground (on a bank if possible), and combining, as I have already expressed it, the process of an eye-sketch with that of a plane-table sketch, it is possible to make a very fair observation. It must be remembered that the only other instrument available in such cases, the prismatic compass, also necessitates a man dismounting in order to observe a bearing. In using the sketching-case in this manner it is of vital importance that it should be laid truly level, so as to ensure the compass turning freely on its pivot.

We will now proceed to the construction of our scales, assuming that we wish to sketch on a scale of 3″ to a mile. Now in the construction of all scales for horseback sketching, it is well to bear in mind that there are two entirely distinct and separate calculations to be made, namely :—

First, To find out what number of inches or decimals of an inch will represent the "measured distance" at the scale we propose to work upon.

Second, With the number of inches or decimals of an inch thus ascertained (and which we must bear in mind are equivalent to a certain number of walks, trots, or canters), to find out how many inches or decimals of an inch will represent any convenient assumed number of hundreds of walks, trots, or canters.

Commencing with the first of these calculations we find out what number of inches or decimals of an inch will represent the measured distance of 400 yards at a scale of 3″ to a mile, as follows :—

$$\begin{array}{cccccc} \text{yds.} & & \text{yds.} & & \text{ins.} & \\ 1760 & : & 400 & : : & 3 & : \text{ answer} \end{array}$$

$$\frac{400 \times 3}{1760} = \cdot 68 ;$$

that is, we find that a line ·68 of an inch in length will represent 400 yards at a scale of 3″ to a mile.

Now for the second part of the calculation. Bearing in mind that since 400 yards are equivalent to 436 walks, 127 trots, or 120 canters, and that each of these number of paces is consequently represented by a line ·68 in length, we proceed to ascertain how many inches or decimals of an inch will represent any convenient assumed number of these paces.

We will first construct a scale of "walks." Since 436 "walks" are equivalent to 400 yards, it will be convenient if we assume 1,600 walks as the length of our proposed scale. Then—

walks walks ins.
436 : 1600 : : ·68 : answer.

$$\frac{1600 \times \cdot 68}{436} = 2 \cdot 49 \text{ inches, or say, } 2 \cdot 5 \text{ inches.}$$

If now we take a strip of paper and, measuring 2·5 inches off the scale on the foot-piece of the board, cut it to that length and then fold it double four times, we divide it into sixteen equal parts, each of which represents a hundred walks. These can now be marked off with a hard pencil along one of the edges of our ruler and marked "*Walks.*"

It will be noted that by assuming sixteen hundred we facilitate the process of doubling the paper and thus obtain the required subdivision of one hundred. In the event of its being inconvenient to assume 1,600, 400 or 800 will be found useful numbers to work with.

To construct a scale of trots, since 127 are equivalent to 400 yards, we had better assume 800 as a convenient number of trots. Thus—

trots trots ins.
127 : 800 : : ·68 answer.

$$\frac{800 \times 68}{127} = 4 \cdot 28 \text{ inches.}$$

that is to say, 800 trots are represented by a line 4·28 inches in length.

Now since the scale of inches on the foot-piece of the board only reads to tenths of an inch, we must measure 4·3 inches off it (as the nearest thing to 4·28 inches), and taking a slip of paper of this length fold it double *three* times, thus dividing it into eight equal portions, each of which represents one hundred trots. These are marked off on the edge of the ruler as before and marked "*Trots.*"

Lastly, with the canters, since 120 of these are equivalent to 400 yards, we can again assume 800 as a convenient number.

canters canters ins.
120 : 800 : : ·68 : answer.

$$\frac{800 \times \cdot 68}{120} = 4 \cdot 53 \text{ inches.}$$

Following out the same process as before, we measure 4·5 inches from the foot-piece and fold a piece of paper of this length *three* times, thus obtaining hundreds of canters. These are marked off on the ruler and marked "*Canters.*"

Thus we have our scales of the paces of our horse made and ready for use, but since when we estimate any distances by eye we do so in yards (and not in horse's paces) it is necessary for us to have a scale of hundreds of yards at 3″ to a mile on our ruler. This can, of course, be taken off the scale on the foot-piece of the board, and it will be found convenient to show about 3,000 yards or so, since it often happens that one may want to show some high ground commanding the road one is sketching along at considerable distances from it. Lastly, it is useful to mark off from the head-piece a scale of Horizontal Equivalents for thirty-feet vertical intervals.

Our straight-edge should now appear somewhat similar to the ruler shown in Fig. 16. It will be noted that the scale of trots, which is the one most frequently in use, is marked off on both edges of the ruler, and in such a manner that, however the latter be adjusted on the sketch, a little care will ensure the hundreds of trots being accessible for marking off distances from any required spot. This is a matter of great convenience when working on horseback, when only one hand is available for manipulating the ruler and pencil.

Having thus prepared our ruler, we will now proceed to make use of it. The working meridian is assumed to be properly adjusted so as to prevent our sketch from running off the board, and its position has been noted as already described. The process of observing the direction of a road is very similar to that with the plane-table. The horse should be turned in the direction required, and the board revolved on the wrist until the magnetic needle coincides with the meridian. The ruler is now turned under the elastic band, so as to be aligned with the distant object selected as marking the direction to be followed, and at the same time the board is brought truly under the eye by gently moving the bridle arm to the right; the direction is then marked on the sketch with the pencil along the edge of the ruler. If at the last moment it be found that the needle is not quite true with the meridian, a slight turn of the wrist will make it so, and this is preferable to revolving the board again on its pivot.

The great point in this observing of directions is, of course, to

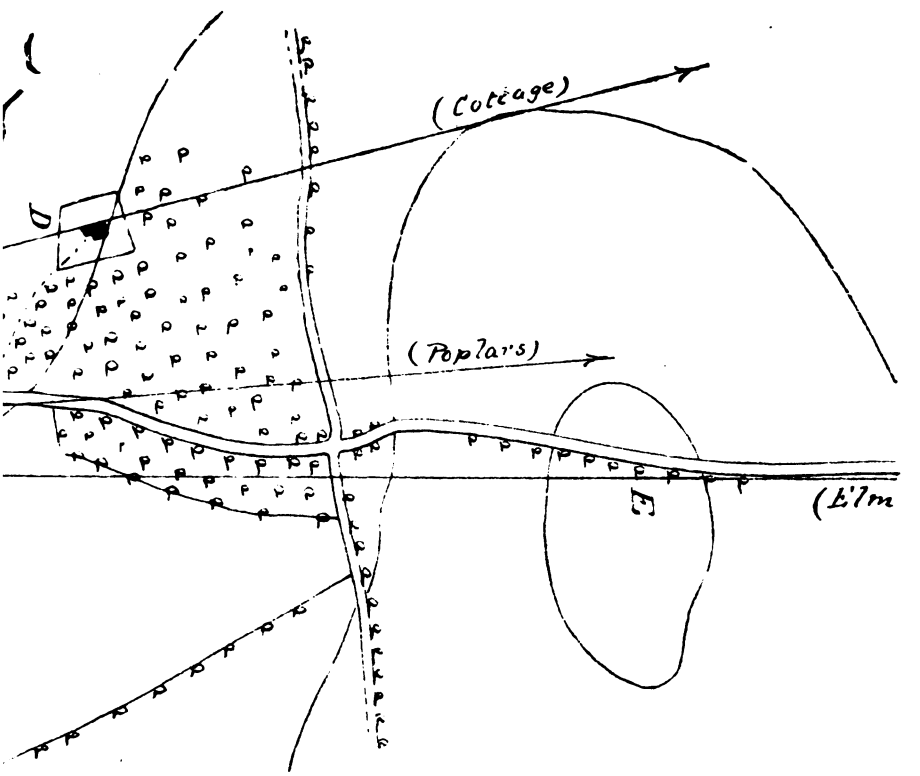
take as long shots as possible. In an enclosed country like England, any attempt to do this gives scope for considerable ingenuity, since when working without the aid of a map it is often impossible to foretell which way a road may trend. On such occasions, when there is any doubt as to the direction the road runs in, the safest method and that by which the quickest work is done, is to take two or more forward shots at likely trees, houses or other objects near which the road may be reasonably expected to pass, and subsequently to utilize the one which experience proves to be the correct shot.

For example, suppose that on arriving at the point A, as shown on the high road in Fig. 17, we find that we can only see along this road for about a hundred yards, and that beyond that point it is difficult to say which way it runs. Looking ahead for any

FIG. 17.

objects to take a forward shot at, we note a cottage, some poplars and a row of elm trees crossing the sky-line to our right front, and the direction of these we note as shown by the three lines radiating from A. In Fig. 18 the state of affairs at this moment is shown in plan; A is our position, B the point where the road turns out of sight, D the cottage in prolongation of the line AB, C the poplars and E the elm trees, distant say, a thousand yards ahead of us, and where it *looks* as if the road crossed over some rising ground.

On continuing our advance, we find on reaching B that the road does not go near the cottage D, but swings off to the right; but on the other hand, a short distance further on we note that it passes about sixty yards to the left of the poplars, and crosses a stream about eighty yards beyond them. The shot at the cottage, beyond approximately fixing its position, turns out to be


(Cottage)
D
(Poplars)
E
(Elm

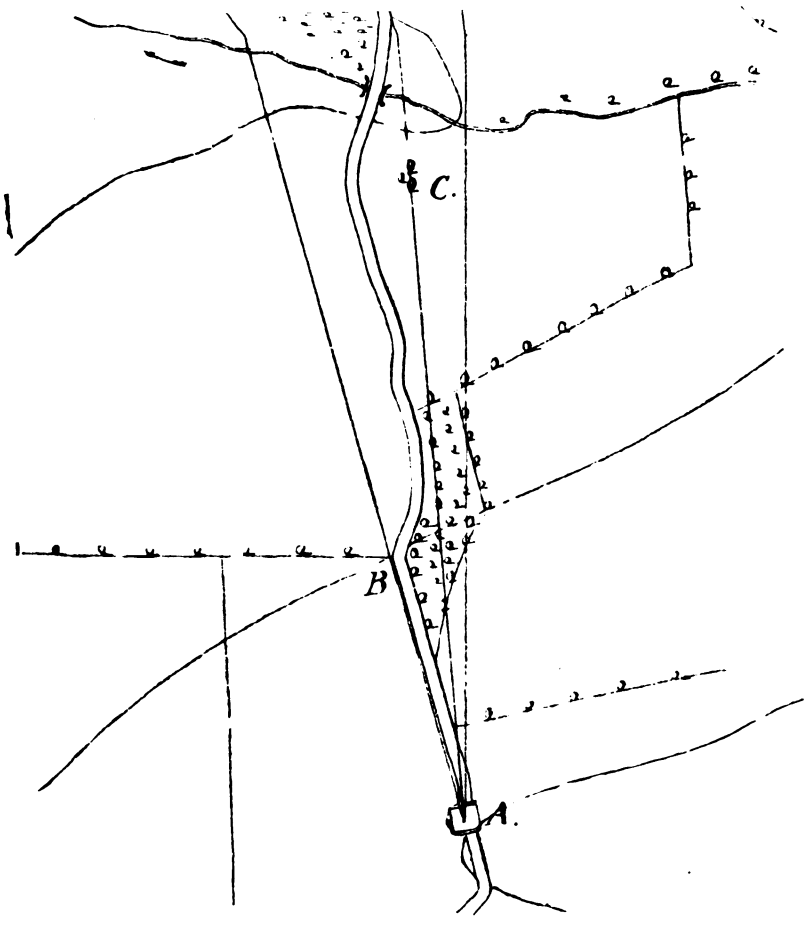


Fig 18 —Method of taking several Forward Bearings from one point

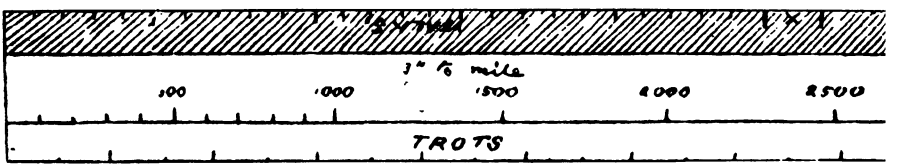
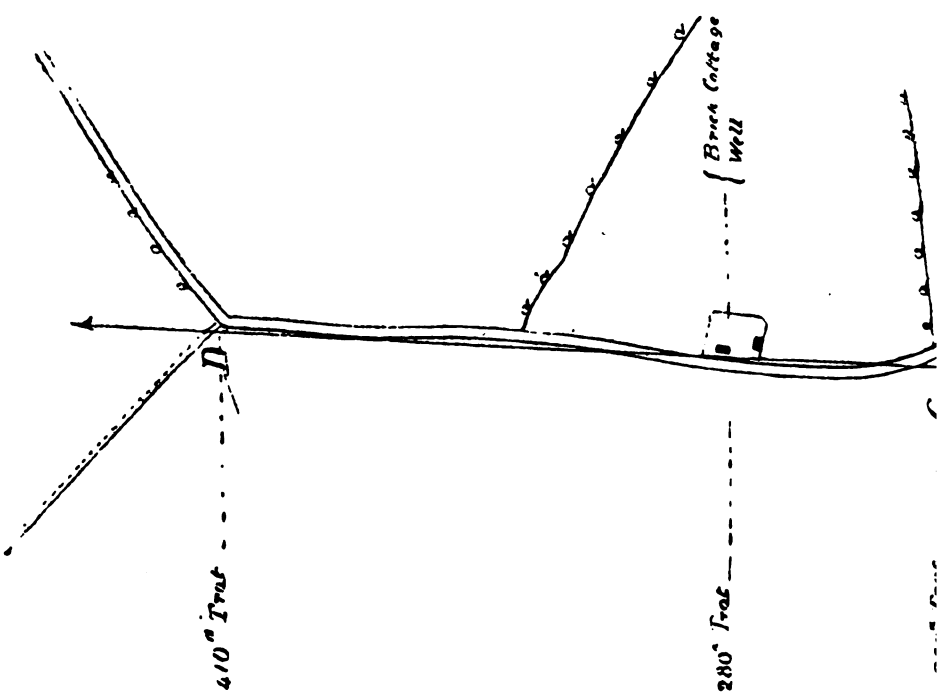
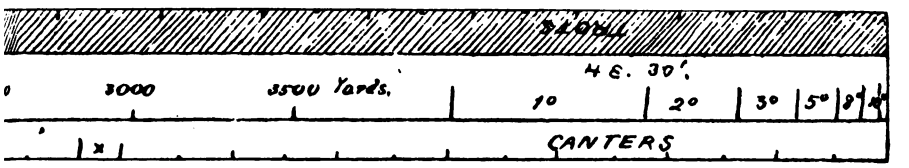


FIG. 16*.—The Straight-edged Ruler prepared for Sketching on





a Horseback, with Scales of "Walks," "Trots," and "Canters."

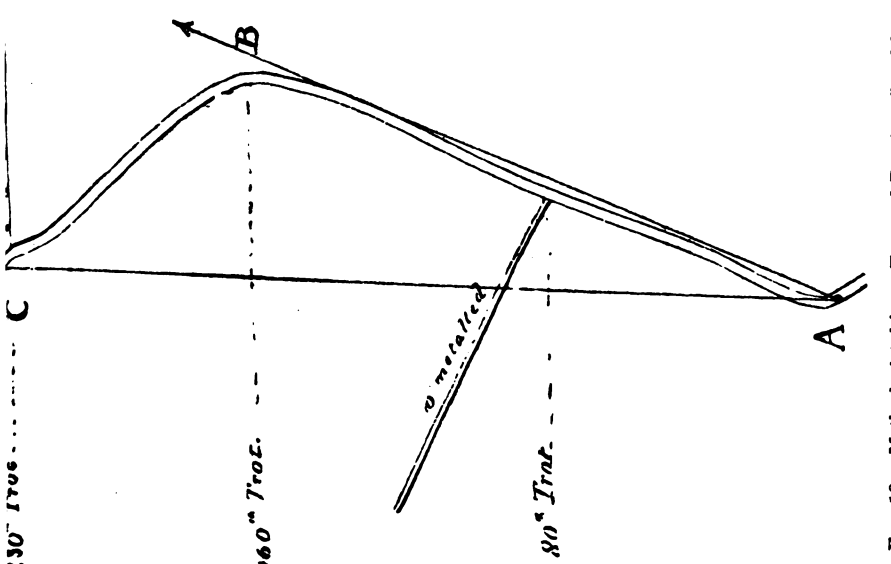


Fig. 19.—Method of taking "Forward Bearings" and keeping a Record of Distances.

useless, as a thick wood prevents our noting its distance from the road.

Riding on to the cross-roads, we find to our relief that the shot at the elms will carry us on all right, since the road runs along their line.

When taking two or more shots from one point, it is always best to write along the lines the nature of the objects aimed at, as shown on the plan. I am quite aware that some precise people will say it would have been preferable to have only taken AB as a first shot, then to the bridge as a second, and so on; but this is just the sort of thing that takes up time, frequent halts and adjustments of the board being incompatible with rapid field-sketching.

Again, if the general direction of a road can be noted for some distance, and its course is irregular, two shots should be taken, one to mark the line it takes at starting, and a second to lay off its main direction. If, now, no detail of importance has to be sketched in, it is a capital plan to start off counting trots and mentally note where the bends come in. Thus, for example, suppose from the point A (see Fig. 19) we note the directions AB and AD, and, trotting along the road, find that we reach the first bend at B at the 160th "trot," the second at C, at the 230th, where we come into the alignment AD, and the end of our "shot" at D at the 410th trot; it is best in this and similar cases not to halt at the various bends, but to proceed straight to D without halting, and then draw in the road as shown.

This same process applies to putting in detail; thus we might, when trotting along any observed line, such as in Fig. 19, note that at the 80th trot there was a good lateral communication going off at right angles on the left side of our road, with a width of 10 feet, metalled. At the 280th trot we might note a small two-storied brick cottage, with a well in the garden, on the right of the road, and so on. All these dodges save time enormously; care, however, must be taken not to overburden the mind at first with too many such details at once.

Should the sketcher find that his forward shot was a failure, and that after following one or two windings of the road he is off his line and in danger of losing his reckoning, it is often possible for him to pick up his position by a "back shot." This should be taken at some conspicuous building, tree, or other object on

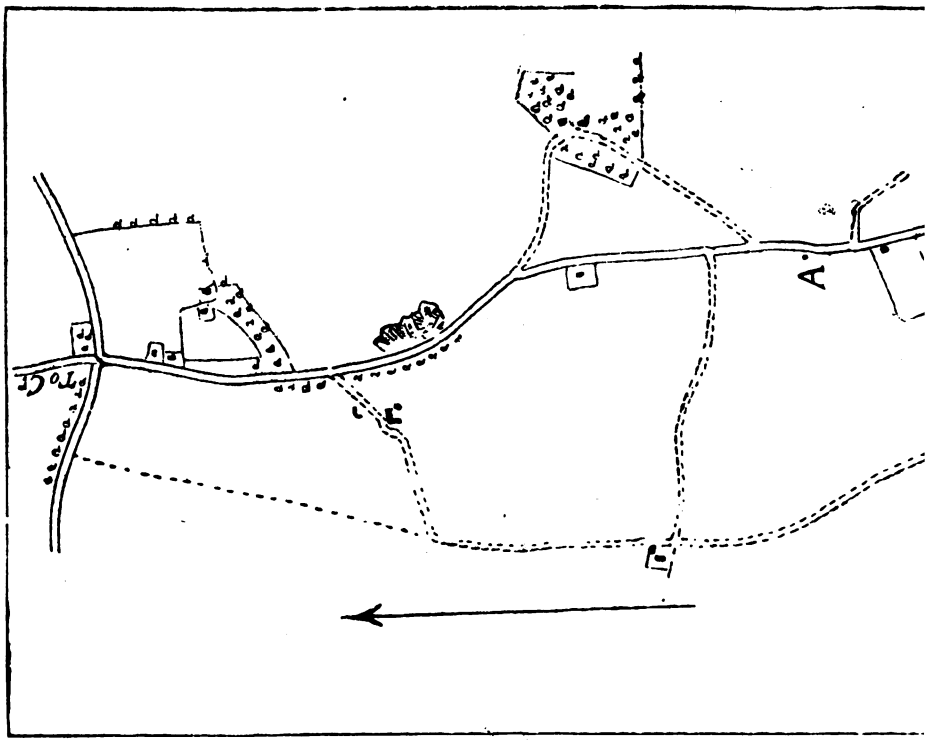
or near to the road he has ridden along, and which he has noted on the sketch, and the number of trots from it or any other recognisable point to his present position then marked off. When working in a hurry this plan sometimes comes in very handy, and saves a sketch from going to grief unutterable, but it requires a man to be a good observer and well practised in the work to use it with effect, except under very favourable circumstances.

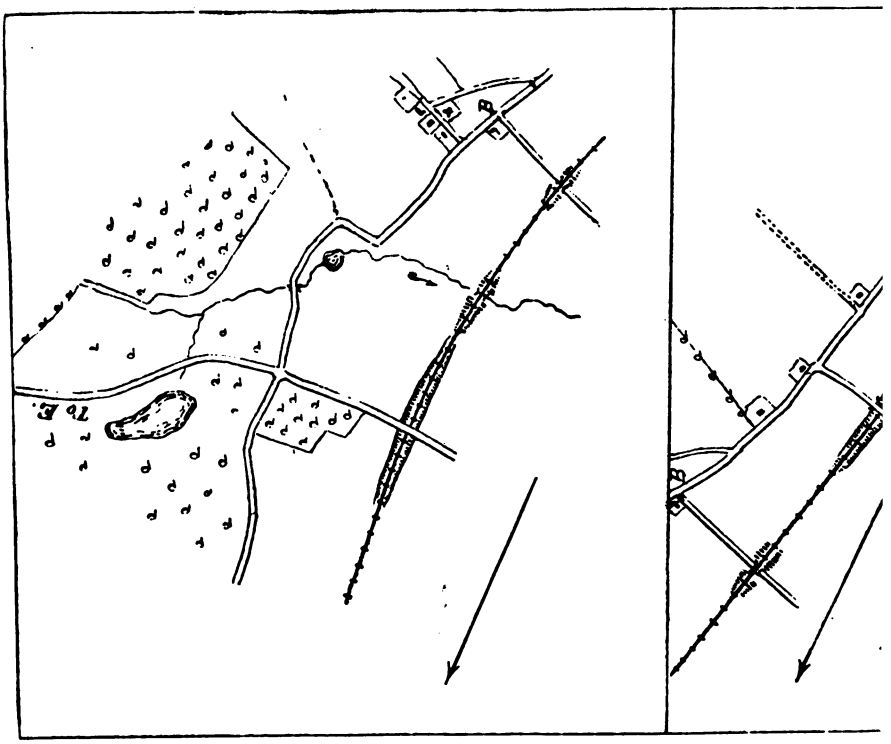
It sometimes happens, by bad luck or bad management, or both, that a sketch of a road will run off the board. When this occurs, the only thing to be done is to rule a line right across the sketch and commence afresh from a point a couple of inches or so above it.

When sketching a road the general direction of which is straight but which winds considerably, as shown in Fig. 20, in the road from D to E, it is often possible to manipulate the sketch so as to avoid altering the position of the working meridian. In the case in point it has been found practicable to keep the road on the paper, with the exception of the elbow it makes between A and B, and other similar deviations from the line of direction beyond the limits shown in the sketch, but which must be taken into account as influencing the arrangement of the road-sketch as shown in the figure. It is evident that in the event of an unbroken sketch of the road being required, the centre section could be cut out and placed in its proper position, and the whole then mounted on a fresh piece of paper. This process of joining up a broken sketch can be performed with extreme accuracy and neatness by sticking a pin through A and A, and, after seeing that the meridians are truly parallel, cutting through both portions of the sketch with a sharp knife.

Sometimes, again, a road may be found, the general direction of which changes. In this case the position of the meridian must be shifted, as shown in Fig. 21; but when this is done, care must be taken to mark its former and present positions most distinctly on the sketch, so as to enable the two portions to be subsequently properly joined together.

Now, besides observing the directions of roads, it is evident that with the cavalry sketching-case it will be quite practicable to fix the positions of distant churches, hills, &c., by what is now termed intersection. In the case of a single building no explanation is necessary, but if it be required to roughly sketch in an


A
To GE


To E.

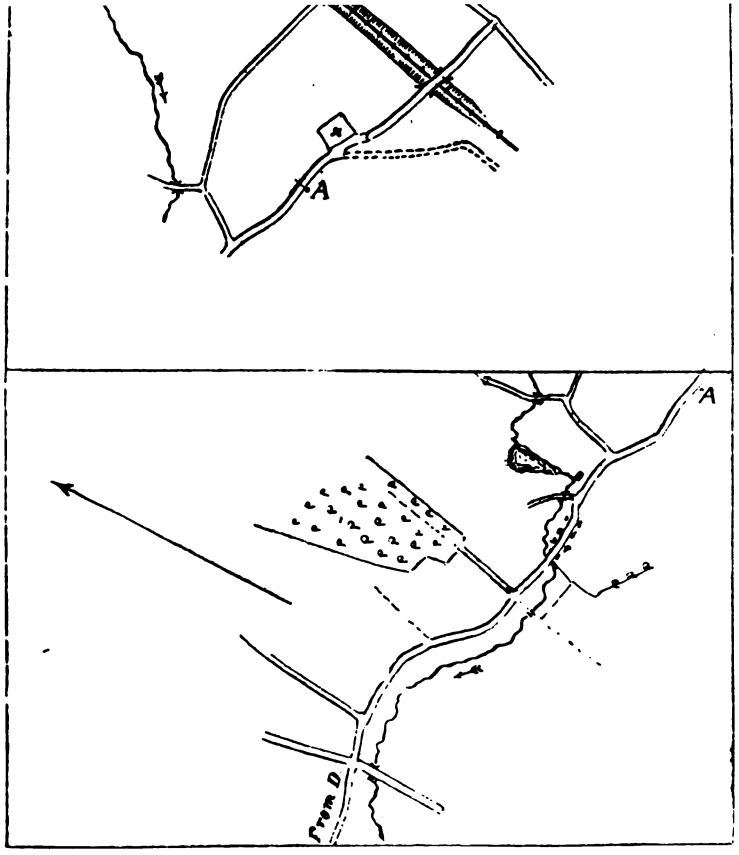


FIG. 20.—Without altering the Position of the Working Meridian.

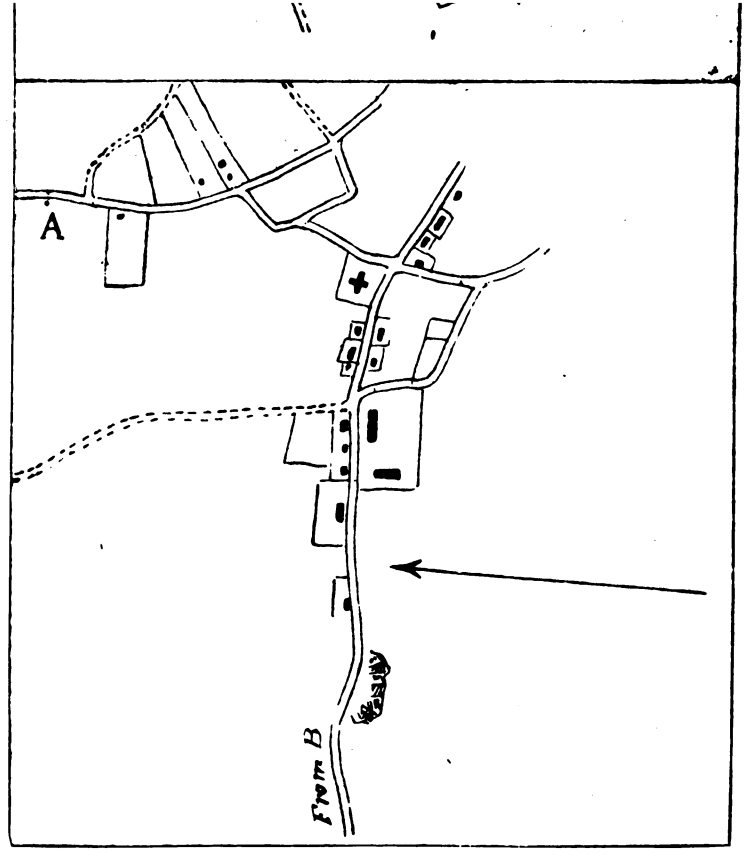


FIG. 21.—By altering the Position of the Working Meridian.

METHOD OF CONTINUING A SKETCH WHEN THE DIRECTION OF THE ROAD RUNS OFF THE CAVALRY BOARD. (Drawn half natural size.)

artillery position, or any high ground commanding the road we are working along, it is best to select two or more conspicuous objects on the ground in question, and take shots at them. Subsequently, when opportunity offers, the second shots are taken and the position of the hill fixed. I say two or more objects, since it commonly occurs that it is impossible to recognise some of these objects when viewed from a part of the road perhaps 3,000 yards from where the first shots were taken. It is needless to say that in fixing any points by this process, it is necessary to be guided by the ordinary rules of surveying as regards good intersections, &c. It is capital practice to thus fix distant commanding ridges by a series of cross shots, and then check them off the Ordnance map, and it will be found that where it has been possible to select well-defined objects for the observations, the work is surprisingly accurate.

With regard to the pace at which a sketch is executed. When accurate work is required there can be no doubt but that the "trot" is the most regular pace at which to work. At times it is absolutely necessary to walk a horse, such as when going up or down hills, traversing rough stony roads, &c. On these occasions care must be taken to make the horse step at his regular pace. If a hill be steep, and it is manifest that a horse is "holding back" and altering his pace, the best plan is to dismount and pace to the end of the hill on foot. In a long day's work this is often a very agreeable change, both for man and horse. It will now and again happen that when in full swing counting "trots," a nasty stony bit of road is met with, which it is best to walk over, the trot being resumed as soon as the road improves. In a case like this the "mental note" might be "167 trots + 108 walks + 91 trots," and when a halt was called, the measurements of distance to mark off on the sketch would be, roughly, "260 trots + 110 walks." The same procedure would hold good if at any time in trotting along a road an opportunity occurred for a canter along the grass alongside it. It is obvious that at a scale of 3″ to a mile, it is no good breaking one's heart about the careful marking off of any uneven number of "trots" or other paces, and that the nearest round number will be amply accurate enough for military purposes. In fact, it is customary to only show fifties of trots or canters on a scale, and hundreds of walks, and to mark off the required number by eye; thus, 320 trots would be marked off as rather less than halfway between the

division taken as 300, and the next 50 beyond. I do not wish to incite anybody to careless or slipshod work, and those who doubt the accuracy of their eye can, if they like, sub-divide their hundreds of trots. It may reassure those who think my method of reckoning rather casual when I say that I have just examined a variety of rulers on which are marked scales for various horses I have sketched with during the last five years, and in no case can I find any division showing less than fifty trots.

So much for the careful reckoning of distances by working with scales constructed from any particular horse's paces, the result of previous experiments. I propose now to deal with the subject in a more general manner, and to take the case of an officer or N.C.O. in command of a small patrol of cavalry, ordered to make a reconnaissance and roughly sketch a bit of country of which no maps are available. Since some horses have a much longer stride than others, it is necessary to select those which neither go too free nor too short. This can be easily done by trotting the detachment for a few hundred yards, and making each man keep count of his own number of trots. It will be found that these will vary from a rate of about 560 to 600 trots a mile, the average rate being somewhere near 580. Thus if two or three horses which appear to go at a medium pace be selected as "distance reckoners," the men riding them can be told off by reliefs to keep a count of their horses' paces between each halting point. Anybody can satisfy themselves of the general accuracy of my statement by trotting a party along a measured distance and making each man count the number of "trots" he takes to cover it. Only recently I carried out this process in order to demonstrate the fact I have stated. Five troop horses were trotted along 960 yards of road with the following results:—324, 318, 314, 312, and 340 "trots." The latter was ruled out as it was plain its paces were abnormally short. The mean of the remaining four was found to be 317, which is at the rate of 581 trots to a mile. To men accustomed to troop-horses and their artifices, it is hardly necessary to say that in any trials of this sort the pace of the leading horse should be taken with all reservation, since many a free-stepping animal which when alone, will cover its mile in 540 trots, will hang back and go as short as possible if from habit it is disinclined to lead the way. Also, it is no good testing troop-horses' paces when their heads are towards home, especially when nearing their stables, as on such

occasions they will imperceptibly increase their stride and make up for home as fast as they can. Thus I have known a patrol which had hardly averaged 580 trots a mile during a long day's work, trot out and cover their last mile in about 560 trots.

Now, although I have stated that 580 trots per mile is about an average pace, for all practical purposes it is more convenient to assume that 600 trots are equal to 1,800 yards, from which it follows that 1 trot is equivalent to 3 yards. This is of course an approximation only.

The following table of the number of trots taken by different horses in 100 yards, and the equivalent rate per mile may be of use :—

No. 1,	30 trots	in 100 yards	= 530	trots	in a mile.
No. 2,	31 ,,	,,	= 545	,,	,,
No. 3,	32 ,,	,,	= 560	,,	,,
No. 4,	33 ,,	,,	= 580	,,	,,
No. 5,	34 ,,	,,	= 600	,,	,,
No. 6,	35 ,,	,,	= 615	,,	,,

Nos. 3 and 4 are probably those most commonly met with.

I cannot give a better idea of this method of sketching by reckoning the average paces of the horses of a detachment, than by describing a ride from Shorncliffe to Canterbury which was carried out on these principles. The party consisted of myself and 7 non-commissioned officers of the 5th Lancers and 14th Hussars; and in order to make the test a perfectly *bona-fide* one, the old Stone Street road from Westenhanger was selected as one which at that time was totally unknown to myself and to the men who accompanied me. On the way from Shorncliffe to Hythe, the detachment was trotted for some distance, and 4 out of the 7 horses which went at the most average pace were picked out. My own horse was ruled out of court on account of its long stride. We assumed that the average paces of the 4 selected horses were about 580 trots, or 1,900 walks to a mile. The men had their cavalry sketching-cases with them, and in Hythe each of them was supplied with a wooden foot-rule (such as can be obtained at any stationer's shop for a penny). It was then explained to them that at the scale of three inches to a mile, at which we proposed to sketch, each half-inch division on the ruler would represent approximately 100 trots, and each eighth of an inch 25 trots or 75 walks. The four men selected for counting duty were told off into two reliefs

of two men each, and instructed to count by reliefs between each point where we might halt in order to sketch in any detail. On halting, the two men on counting duty gave me the number of trots or walks they had each reckoned and I adopted roughly the mean of these and gave it out as the distance covered.

The road is an old Roman one and runs almost straight, hence there was little trouble with regard to our direction, and it is satisfactory to record that we found no mile-stones on the way whereby we could check our distances. The result was extremely interesting, and was only slightly marred by that unfortunate factor of "human nature" which it is impossible to eliminate from such undertakings. The total distance of which we kept a record was just under 10 miles, namely 16,850 yards. The greatest errors were respectively 540 yards too long and 400 yards too short; but the mean distance, taking the long and the short together, we made to be 16,900 or only fifty yards too long.

None of the party had a map and, as I have already said, none of the party had ever traversed the road before. Now as to the errors I alluded to, I am compelled to admit that I myself was guilty of the heinous and unpardonable crime of losing count of one hundred trots, that first and last mistake which all surveyors commit now and again. At the scale we were using, 100 trots was equivalent to 300 yards, and my own sketch was 380 yards out, giving a margin, "errors excepted," of under 100 yards in close on 10 miles. The non-commissioned officers' sketches had the same faults; some had dropped one or more hundreds of trots, others had measured off too many; but the nett result, as I have already said, gave us an average of only 50 yards error, which I submit is a pretty conclusive proof that an accurate record of distance *can* be kept, if required, by a party of cavalry moving with a fair degree of rapidity through a piece of country.

I should mention that the distance, 16,850 yards, was measured from the heights above Stanford to where the "Stone Street" road enters Canterbury. The time occupied in sketching the whole road was exactly 2 hours and 45 minutes, giving a rate of about $3\frac{1}{2}$ miles per hour.

In the preceding reconnaissance, the method of using a foot-rule as a ready-made scale for sketching on horseback was referred to. This process, with a little care, can be extended so as to make a foot-rule do duty under almost any conceivable circumstances. The *modus operandi* is briefly, to assume that a fixed

number of trots go to an inch, and to vary the scale of the sketch according as to whether a horse paces long or short. It is plain that the scales thus brought into use will vary somewhat in their relative proportions to that of the ground they represent; but provided a clear and legible scale be drawn on the sketch when completed, it is of very little moment whether any individual reconnaissance be executed precisely at the conventional 2″ or 3″ to a mile or at some slightly different scale.

The business point of view of the affair is this, that by using these ready-made scales, a man can start off on a reconnaissance at once and execute a serviceable sketch without losing precious time testing his horse's paces and constructing scales for them.

The importance of this cannot be over-estimated. In a question such as that of reconnaissance, when time may be the all-important factor, the absolute accuracy of the distances recorded becomes a matter of secondary importance.

No doubt the most finished and correct work is that executed on a horse whose paces have been thoroughly tested and chronicled. There are, however, degrees of accuracy, and it is very plain that on the emergency of a reconnaissance sketch being required in a hurry, it would be far more preferable to be able to execute one that was approximately correct, and was ready when wanted, than to attempt a more accurate sketch which could not be finished in time. Suppose, for instance, that a man suddenly ordered on such a job, and riding a strange horse, had guessed its paces to be 550 trots to a mile, when they were actually 580, and that he had thus got an error of about a hundred yards in every mile: it is, to say the least, highly improbable that this error in the calculation of his distances would seriously affect any military operation; whilst on the other hand, by starting away at once and getting back in time, he might have been able to obtain information, as regards the topographical features of the ground, of incalculable importance to his chief.

For the benefit of those who may wish to follow me out in my line of argument, I annex a tabular form showing what I believe to be the simplest and most effective method of using a common foot-rule as a scale of "walks" or "trots," in lieu of constructing regular scales. On reference to this table it will be noticed that I have sacrificed everything to the main idea of making the quarter or half inch divisions on the foot-rule represent in every case the same number of trots and walks, no matter what the pace of the

horse may be. In the two instances in which I have departed from this rule, it has been because the number of trots and walks given happened to work out exactly to a scale of 2″ or 3″ to a mile.

In order, then, to use any of these scales for sketching on horseback, all that is required is an approximate idea of the paces of the horse which is to be ridden. In constructing an ordinary scale of furlongs or yards for the sketch when finished, the number of inches and decimals of an inch which represent a mile or so many yards, would be measured off the foot-piece of the board on a slip of paper which would be folded the requisite number of times to show furlongs or hundreds of yards.

To take an example; suppose we have been ordered to make a reconnaissance sketch at a scale of about 3″ to a mile, and that our horse trots at the rate of 560 to a mile. Looking in the first column for 560, and running our eye along this line, we find that 100 trots will go to half an inch, and that the scale we work on will be 2·8″ to a mile, or 800 yards to 1·3″. To construct a scale of yards for our sketch we take a piece of paper 1·3″ long and fold it double twice, thus obtaining divisions of 200 yards each.

Now it has probably occurred to some of my readers that all this is taking a lot of trouble about a very small matter, and that, after all, the difference between the various scales is very trivial, and hardly worth bothering about. I fully admit there is some truth in this, and that taking into consideration the rough and ready manner in which recorded distances are measured off the ruler in the field, and especially the smallness of the scale upon which many sketches are executed, it is a question whether such extreme care to attain accurate results is at all times necessary.

By disregarding the paces of a horse altogether, the greatest possible error that could be introduced into a sketch would be by using a scale of trots of 540 to a mile with a horse whose trots averaged 600 to a mile, or *vice versâ*. This extremely improbable contingency would give an initial error of 60 trots, equivalent to about 200 yards in every mile. This may be taken as the maximum, and it is evident that it would only be very unlikely that an error of such dimensions could be incurred.

By adopting a medium pace, say of 570 to 580 trots to a mile as a standard for general purposes, it is plain that the limits of any possible error are reduced to about 30 trots, or 100 yards, either way.

FIG. 22.—TABLE OF TROTS for determining the scale upo
" scale o

For 3″ to 1 Mile (approximately).

TROTS.			SCALE.	
Number per Mile.	Number to: ¼″	½″		
540	45	90	3″ to a mile	80(
560	50	100	2″·8 ,,	
580	50	100	2″·9 ,,	
600	50	100	3″ ,,	

For 2″ to 1 Mile (approximately)

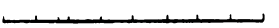
Per Mile.	¼″	½″		
540	70	140	1″·93 to a mile	160
560	70	140	2″ ,,	
580	70	140	2″·07 ,,	
600	75	150	2″ ,,	

TABLE OF WALKS (calculated only approximate

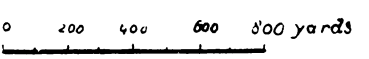
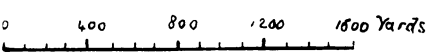
Per Mile.	¼″	½″	SCALE.	
1800	150	300	3″ to a mile	8(
1800	200*	450	2″ ,,	16(

* This should of course be 225, but 200 has

on which a sketch is drawn, when a foot-rule is used as a
f trots."

	Scales showing the comparative length of 800 Yards, at the various scales employed.
0 yards = 1″·36	
,, = 1″·27	
,, = 1″·32	
,, = 1″·36	
	Scales showing length of 1600 Yards.
00 yards = 1″·75	
,, = 1″·81	
,, = 1″·88	
,, = 1″·81	

ely) for general use with above scale of trots.

00 yards = 1″·36	
00 ,, = 1″·81	

as been taken for convenience of measurement.

Assuming, then, that occasions may arise when men may want to make a sketch at short notice, the following *rough* rules may be laid down for using a foot-rule for reckoning trots and walks:—

(1) When sketching at *about* three inches to a mile, assume *in all cases* that about 200 trots and 600 walks go to 600 yards, and are represented by an inch on the foot-rule.

(2) When sketching at *about* two inches to a mile, assume *in all cases* that 300 trots and 900 walks go to 900 yards, and are represented by an inch on the foot-rule.

(3) That when sketching under either of the above conditions it must be remembered that the *longer* the stride of the horse ridden, the *less* will be the actual scale of the map executed.

This follows for the same reason that when a man's paces are too long his sketch is too short, and *vice versâ*. For example, a man who paces 38 inches, and who counts these as yards, will lay off on his sketch 100 yards when he has actually traversed about 105 yards; that is to say, all his distances will be short.

CHAPTER IV.

RECONNAISSANCE ON A COMPASS-BEARING.

The distinction between this and other Work.—Guiding Troops on the March.—Use of Sketching-case when thus engaged.—The Reckoning of Bearings by Degrees and by Points.—Reduction of Points to Degrees.—Error caused by taking an Incorrect Bearing.—Reconnaissance in an Open Country on a Compass-bearing.—The Night March on Metemneh.—Reconnaissance in an Enclosed Country (1) with the Aid of Maps; (2) without a Map.—Reconnaissance across Romney Marsh.—The Importance of utilizing any Adventitious Aid in Field-sketching.—Value of Railways when Contouring.—How to note Gradients of Roads precisely.—Rough Method of Contouring without Instruments on Foot or on Horseback.—Measurement of Masonry, Timber, &c.—Calculation of the Width of Bridges, Cuttings, &c.—Sketch by the aid of Telegraph Poles.

Now although the ordinary class of reconnaissance work executed on the cavalry sketching-case is dependent, so far as neat work is concerned, on the accuracy with which the compass-bearing of the line of direction has been noted, there is an especial branch of the subject which, for want of a better name, I must call "Reconnaissance on a compass-bearing."

The chief distinction I would draw between the two is that in the former the bearing of the line of direction is ascertained simply as a means of ensuring that the sketch shall be conveniently executed along the length of the paper, whereas, in the latter case, the compass-bearing is the ruling factor of the whole operation. Thus, a reconnaissance may be required to be made on some objective, the position of which is only indicated by a compass-bearing, such as, for example, a town twenty miles to the north-west. In this case it would be our business to follow this line as closely as possible, until the vicinity of the town was reached, consistent with the duty of gaining all necessary information of the best routes to be followed by troops on the march, or on any other points specially required.

This question of reconnaissances on compass-bearings embraces a very wide field of topographical work and includes the important duty of guiding troops, either through an enclosed country along

roads, or on a direct line across open ground. This, although not reconnaissance in its more restricted sense, is a class of work with which it is so much mixed up, that it is impossible to ignore it when dealing with reconnoitring on a compass-bearing. The same officer who is employed one day in sketching a line of advance, or in reconnoitring and reporting on the condition of some particular route, may next day find himself ordered to guide a column on the march, either through a piece of ground with which he is acquainted, or (with or without the aid of a map) to lead it, to the best of his ability, through a strange bit of country. This is as it should be, for assuming other things to be equal, nobody should be better qualified to perform this, at times, difficult service, than a man who has devoted all his energies to studying the topographical peculiarities of the country in which the operations are taking place.

When using a map for this work, it is an excellent plan to cut or fold it to the width of the sketching-case and fasten it on the rollers. The working meridian being adjusted correctly, the map can be always truly "set" at a moment's notice. If, in addition, the route to be followed be marked clearly with a coloured chalk pencil and any special landmarks similarly brought into relief, the work of keeping an eye as to the exact position at any moment will be immensely facilitated.

When working without a map, the sketching-case comes in very handy to make notes as to distances traversed since last halt, duration of halts, time, estimated rate of advance, &c. In this case, however, it is best to use a sizeable compass to observe the bearing of the line of advance from time to time. Opinions differ as to the sort of compass to employ, some preferring the bar-needle pattern, for the reason that it sooner ceases to oscillate, and is thus quicker to use. On the other hand, the floating card pattern is decidedly more convenient for noting the bearing required. For night work, a luminous card is invaluable; and those in which the northern half is black with white figures, and the southern half the reverse, are especially excellent, as there is no possibility of making an error as to north and south.

Although, for the sake of uniformity, and also so as not to confuse those who may not be *au fait* at "boxing the compass," I have in the previous chapters always reckoned the bearings by "degrees"; in practice, when steering by a compass, I myself invariably reckon them by "points." This, however, is entirely a

matter of habit. The reduction of points to degrees is not a very difficult matter, especially when working, as we are, in a rough and ready fashion.

For the benefit of those unaccustomed to work with the points of the compass it may be mentioned that each "point" is equal to $11\frac{1}{4}°$ (since the circle of 360° is divided into 32 points). Hence a half point is $5\frac{5}{8}°$ and a quarter point $2\frac{13}{16}°$. But since for our work any observation within a degree or so of the true bearing is considered to be ordinarily sufficiently accurate, it is plain that these fractional parts of a degree are an unnecessary refinement. Thus I usually reckon a single "point" as 11°, a half point as 6°, and a quarter point as 3°, and in consequence it follows that a point and a quarter is equal to 14°, a point and a half to 17°, and a point and three quarters to 20°. Thus for example, N.W. by N. $\frac{3}{4}$ N. is reduced to degrees as follows:—

N.W. = $\frac{1}{8}$ of 360° =	45°
minus N. $\frac{3}{4}$ N. ($1\frac{3}{4}$ points)	20°
	25°

that is N. 25° W.

This is, of course, readily proved by the converse, for since N.W. by N. $\frac{3}{4}$ N. is just $\frac{1}{4}$ point W. of N.N.W. we get,

N.N.W. = $\frac{1}{16}$ of 360° =	$22\frac{1}{2}$°
plus $\frac{1}{4}$ point W. . .	3°
	$25\frac{1}{2}$°

or N. $25\frac{1}{2}$° W.

It will thus be seen that this rough method is good within half a degree under any conditions. Once again, I fear that some may say that this class of work is very inaccurate; but in reply I would ask them if they have ever worked out what amount of lateral deviation an error of 1° or 2°, or even 3°, in the observation of the direction of a road means in actual work in the field?

Remarks are sometimes made about the "grave error" inherent in an instrument like the sketching-case because at times a direction is only observed within 2° of its true bearing. But it must be borne in mind that the usual forward bearing of a reconnaissance sketch in an ordinary enclosed country will be often only a few hundred yards, half a mile being an exceptionally long distance to see ahead of one along a road. The following table

shows the amount of lateral error in yards at various distances caused by taking an incorrect bearing.

Length of "Forward Bearings."	Error caused by taking a Bearing.		
	1° out.	2° out.	3° out.
100 yards.	1¾ yards.	2½ yards.	5¼ yards.
300 ,, .	5¼ ,, .	10½ ,, .	15¾ ,,
500 ,, .	8¾ ,, .	17½ ,, .	26 ,,
1,000 ,, .	17½ ,, .	35 ,, .	52 ,,
1 mile .	31 ,, .	62 ,, .	93 ,,

Now admitting that 1° and 2° is a common error, and that 3° also sometimes occurs on a short forward bearing taken in a hurry, it will be noted that even with the latter, the deviation in a mile is less than a hundred yards.

If a long bearing be taken, either in the field of some distant object from a favourable point of view, or indoors from off a map, it is manifest that especial care should be used to ensure its accuracy, since a mistake of a degree or two in this case would soon mount up to a considerable error.

Taking an extreme case, supposing that it were required to march on a town distant twenty-five miles and that a compass-bearing were taken from a map which by some mistake was 2° wrong. At the end of the twenty-fifth mile the lateral deviation would be: $62 \times 25 = 1{,}550$ yards or considerably under a mile. Similarly an error of 3° or a quarter of a point, would give a deviation of under a mile and a quarter. This, taking in consideration that the point aimed at would probably be some conspicuous town or other easily recognized object, would not be a very serious error. Again, suppose that in a five-mile march on a bearing, owing to carelessness or some extraordinary error, the bearing of the route was taken a whole point ($11\frac{1}{4}°$) wrong, the lateral deviation at the end of the march would amount to almost exactly a mile. But with the most rough and ready work, it is always possible to steer within half a point of the required course, and if ordinary care be used, the deviation should certainly be less than a quarter-point either way.

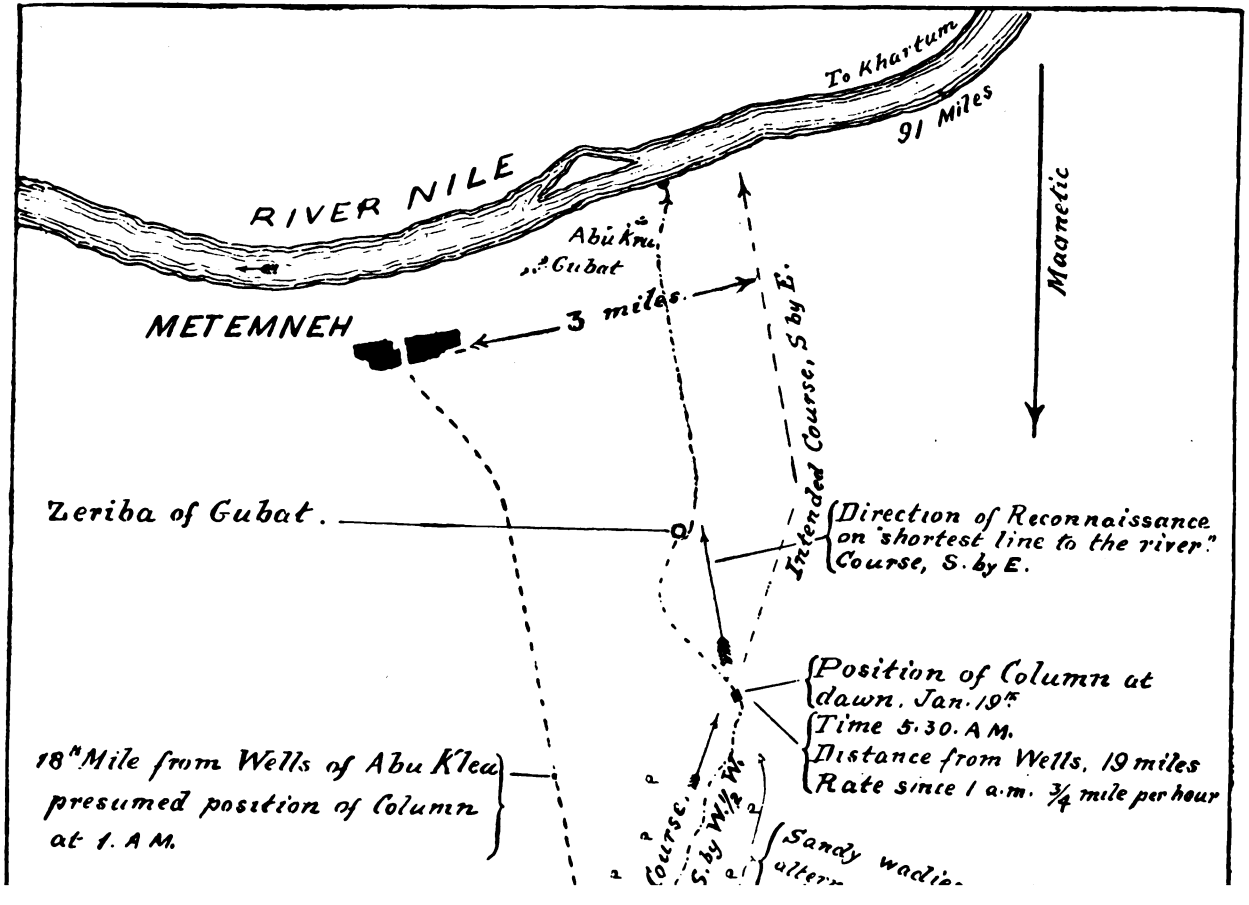
A reconnaissance on a compass-bearing is not a very difficult undertaking in an open and undulating country, which permits the free movement of troops in any direction, and consequently

along the line ordered. In an enclosed country, like England, however, where all movement is restricted to the roads, it is not always such an easy matter to find one's way along bye-roads and lanes, and at the same time to adhere to the general line of advance, which would be indicated by the magnetic bearing of the line to be reconnoitred.

The two extremes of this class of work may fairly be taken as represented on the one hand by our desert marches in the Soudan, and on the other by reconnaissances made in an enclosed country like Kent, on a compass-bearing. In the first instance, the difficulties from a sketching point of view are but few, since there is nothing to cause any deviation from the line of advance beyond the necessity of avoiding bits of rough ground. Thus in our march from Korti to Gakdul Wells, between January 8th and 13th, 1885, the general bearing of our line of advance was S. 62° E. Again, on leaving Gakdul, the general bearing of the line thence to Metemneh was S. 22° E. The camel track, beyond making a short detour round some rocky spur or skirting some hills so as to avoid the deep dry water-courses in the sandy flat below them, never deviated much from these bearings, except in the broken ground about Abu Klea. The result was that it was possible to keep the sketch on one's board the whole time, the position of the working meridian being altered 40° nearer to the south on leaving Gakdul. On this occasion I had no graduated collar fitted to the compass, and so had always to be on the look-out to see that the latter had not shifted. Nothing could better show the advantage of a graduated ring than extended work of this sort, where a sketch is continued on the same bearing for several days in succession.

Not only is the sketching-case thus useful when sketching on a bearing, but it is of great value when marching on a bearing, and it is desired to keep a "dead reckoning" in the manner which has been already alluded to, of the course followed.

On the day after the action of Abu Klea when we resumed our advance, my orders were to lead the column along the track to Metemneh, bearing S. by E. for about eighteen miles, and then, when within five or six miles of that town to incline to the right on a bearing of about S. by W. so as to strike the river at a point *at least* two miles above it. These bearings gave one a precise idea as to the direction, but the difficulty was to keep any exact record as to distance. This was owing to the incessant halts and


To Khartum
91 Miles
RIVER NILE
Abu Klew
& Gubat
METEMNEH
3 miles
Magnetic
Intended Course, S by E.
Zeriba of Gubat.
Direction of Reconnaissance on "shortest line to the river" Course, S. by E.
Position of Column at dawn. Jan. 19th
Time 5.30. A.M.
Distance from Wells, 19 miles
Rate since 1 a.m. 3/4 mile per hour
18th Mile from Wells of Abu Klew
presumed position of Column
at 1. A.M.
Course S. by W.1/2 W.
Sandy wadies

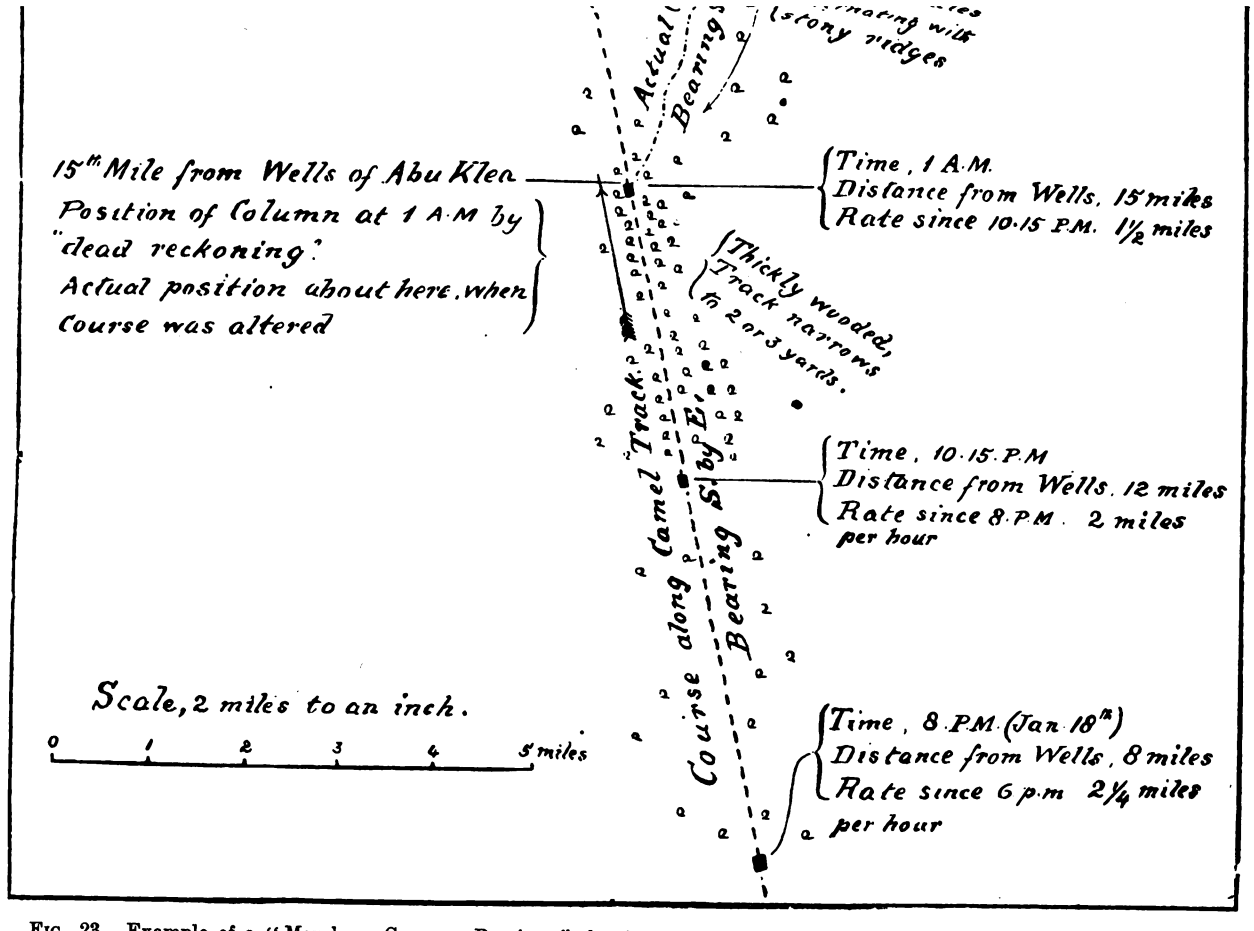

Actual Bearing
Stony ridges
15th Mile from Wells of Abu Klea
Position of Column at 1 A.M by "dead reckoning."
Actual position about here, when Course was altered
Time, 1 A.M.
Distance from Wells, 15 miles
Rate since 10.15 P.M. 1½ miles
Thickly wooded, Track narrows to 2 or 3 yards.
Camel Track.
Course along S. by E. Bearing
Time, 10.15 P.M
Distance from Wells, 12 miles
Rate since 8 P.M. 2 miles per hour
Scale, 2 miles to an inch.
0 1 2 3 4 5 miles
Time, 8 P.M. (Jan 18th)
Distance from Wells, 8 miles
Rate since 6 p.m 2¼ miles per hour

FIG. 23.—Example of a "March on Compass Bearings," showing method of keeping a "dead reckoning" of course followed.

confusion into which the column was thrown in marching through a wooded country by night. For many hours I kept a careful record of the lengths of the halts, noting them down on my board and subtracting their sum, when reckoning up the time we had marched and the distance we had covered in the preceding hour or hours. About 1 A.M. the dead reckoning was as shown on Fig. 23, giving a minimum distance of fifteen miles from the wells of Abu Klea. At the same time it was impossible to be certain that we had not covered eighteen miles, and as it was of vital importance to avoid Metemneh, the change of direction was ordered to the S. by W. Events proved that this was done somewhat prematurely; hence when day broke, the river was not yet in sight.

At this juncture, when the question arose as to which was the most direct line to the river, the value of a compass-bearing was well exemplified. As has been already stated, the general bearing of the line of advance from Gakdul to Metemneh was S.S.E. (S. 22° E.), whilst that of the camel track leading to Metemneh, and which we had quitted at 1 A.M., was S. by E. (S. 11° E.), hence it was evident that the shortest line to the river (whose course was W. and E.) *must* lie somewhere between these two. A reconnaissance was therefore made on the old bearing (S. by E.), and after riding in this direction for a couple of miles we sighted the line of the Nile about three miles to our front, also Metemneh, out of which the enemy were swarming to cut us off from the river. Then ensued the action of Gubat, in which Sir Herbert Stewart was mortally wounded. In the afternoon, when ordered to guide the square on its march to the river (which was not visible from the point where the zeriba action was fought), we advanced on a general line, which was practically our old bearing, viz., a little east of south, and this brought us down to the Nile about two miles from Metemneh.

The two chief points to be noted in this example are: (1) the importance of being able to keep a record of distances traversed, especially when a change of direction is contemplated, and (2) that when thus using a magnetic compass in a country where there is no local attraction, if attention be paid to the bearings of successive lines of advance, it is absolutely impossible to lose one's general direction. It is interesting to note that an error in the reckoning of distances (such as ours at 1 A.M. on Jan. 19), although no doubt very undesirable and disappointing at the time,

is not such a serious matter as might be imagined; for example, had we continued on the new course, S. by W. ½ W., as originally ordered, and wheeled on sighting the river-line, we would have struck it certainly not more than three miles above Metemneh, and thus within a mile of our intended point. Anybody who has any experience of marching troops on a compass-bearing by night will appreciate what a slight error this was in a twenty-four mile march through a difficult and absolutely unknown country.

This example has been given somewhat *in extenso*, as it was probably conducted under the most arduous circumstances possible, and combined the three processes of a reconnaissance sketch on a bearing (until nightfall on the 18th), a march on compass bearings by night, and, lastly, a reconnaissance on a compass-bearing (after daylight on the 19th) to find the river.

Fig. 23, which is a portion taken from the original sketch commenced on Sunday, Jan. 18th, noted on during the night-march and following morning, and finished on the 21st, shows the method of thus keeping a rough record of a line of advance on compass-bearings. It also exemplifies the error which an incorrect reckoning of distances traversed brings into such work.

Turning to reconnaissance work nearer home, I will now briefly describe a march on a compass-bearing in England, and take as an example one made from Shorncliffe on Canterbury, with the aid of a "skeleton route," enlarged to a scale of three inches to the mile from the one-inch Ordnance Survey. In this instance we ruled a line straight across the map from the Camp, Shorncliffe, to Canterbury Cathedral, and limited our enlargement to a careful reproduction of all the roads or tracks of every sort which our straight line intersected, and which approximately followed its general direction. The object of this reconnaissance was to examine and report on the practicability of any route suitable for the movement of a body of cavalry direct on Canterbury without interfering with either the main Folkestone and Dover roads to the eastward, or the Stone Street road to the westward. The portion of the country traversed is much wooded and enclosed, besides in some places being very broken; the numerous roads and tracks shown on the Ordnance map are in many cases only footpaths or grass-rides. Hence this reconnaissance proved to be a rather troublesome undertaking. It afforded, however, most excellent practice in map reading, and in the process of map correcting, as regards details of topography affecting military opera-

tions. On several occasions when the bye-lanes we were following led us to a point whence several tracks radiated, the only possible way of picking up our route was to "set" our boards by the compass and decide which of the tracks appeared to lead in the required direction and at the same time gave fair promise of not landing us in a *cul-de-sac*, as actually happened more than once.

This necessity of having constantly to make the direction of our movements dependent upon as close an adherence as practicable to the bearing of our line of advance, gave good opportunities for the practical use of the magnetic compass.

I have given no illustration of the sketch made, as it was almost identical in its nature to the examples given in Chapter II. of the portion of the Hythe-Ashford road. Especial attention was, however, directed to the width, gradients, and actual condition at the time of the route followed as well as to that of all lateral roads, tracks, or paths which came under our observation.

So much for a reconnaissance on a bearing with the aid of a map; I will now give an example of a march on a compass-bearing in England without the aid of maps.

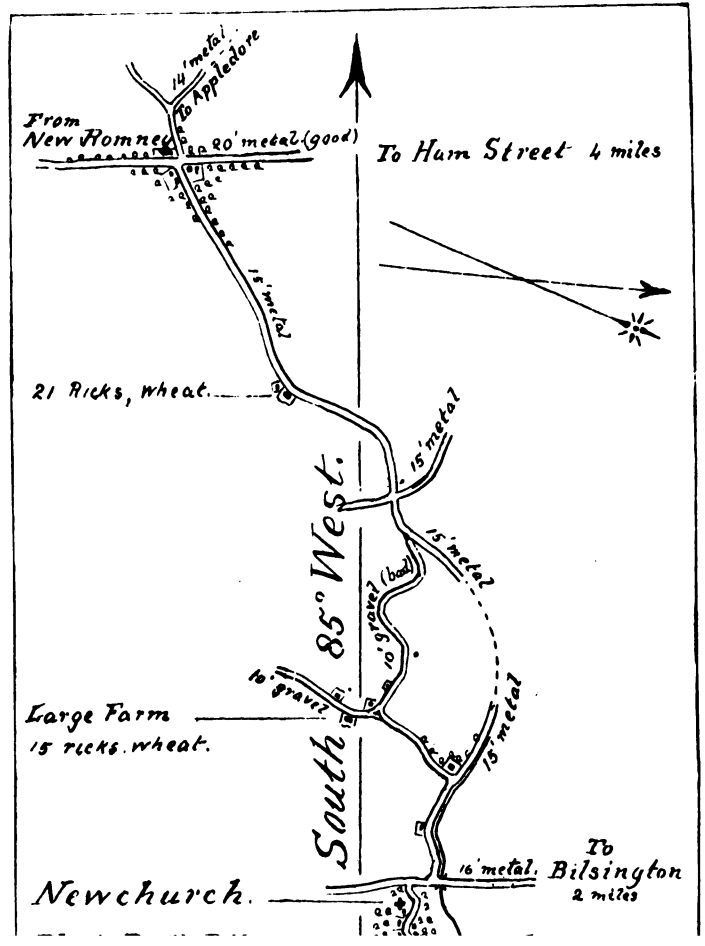
Many of my readers, especially those who have been to Hythe, have, no doubt, a recollection of the "Romney Marsh," as the remarkable peninsula which juts out into the Channel between Sandgate and Rye is commonly called. I had for a long time been anxious to try the experiment of sketching on a bearing in an enclosed country where landmarks were few and difficult to identify, and a very short acquaintance with the outskirts of the "Marsh" convinced me that it would afford a most favourable piece of country for the work contemplated.

In a hilly country, although the view is at times much restricted, opportunities will generally occur for the reconnoitrer to gain some commanding ground whence he can get a good view ahead, and so pick up points on his forward bearing, and at the same time get a good idea of the general "run" of the ground, which may assist him not a little in selecting which turns of the road to follow. On the other hand, on such level ground as the Marsh, there is no chance of getting a view except from the top of a church tower, and unless provided with a map on which every yard of the course taken can be carefully followed, the stranger is apt to find himself almost as much "at sea" as if steering in mid-channel without a chart. With a map, of course, much of the difficulties would disappear, except in hazy weather; but in

summer, the view is much impeded by the distant hedgerows and trees in them, which latter conceal the church-towers and other landmarks to an extent that must be seen to be believed.

So much for the Marsh; now as to our march and sketch. The general idea was that a large force was ordered to march from Shorncliffe to Appledore and Rye, and that the main road from Hythe, *viâ* New Romney, and also the grass road in rear of the Royal Military Canal were detailed for troops, whilst information was required as to whether it were possible to march a column direct from Hythe to Appledore across the Marsh. A study of the Ordnance maps, both six-inch and one-inch, will show that a perfect network of roads of sorts intersect the Marsh in every direction, but it is also intersected by the deep and wide "guts" or "sewers" whereby it is drained, and the endless smaller dykes and ditches which act as feeders to these. Few people, beyond those who live in the actual localities, are acquainted with the nature of these roads, many of which are merely cart-tracks between hedgerows which eventually conduct one into some extensive bit of pasture land surrounded by impassable dykes.

In order to make the experiment a *bonâ-fide* one, no maps were allowed to be brought out, neither was our objective given out to the men until we had left camp. When clear of Hythe and on the road near the rifle-ranges, the party was halted, and the general idea issued. It was a dull autumn day, but it was possible to make out the high ground above Rye and south of Appledore on the far side of the Marsh, distant about fifteen miles. Appledore itself was invisible, but the compass-bearing of the line we were to follow was taken as "west," or thereabouts, and we adjusted our working meridians accordingly. A line ruled down the centre of the paper on our boards indicated our general line of advance. We then started off sketching in the usual manner with four men told off to keep count of the "trots" by reliefs. The road was extremely tortuous, winding about in the most perplexing and aggravating manner and necessitating an endless number of forward bearings to be taken, often at no better objects than trees or bushes at the turn of the road ahead of us. As we advanced into the Marsh, the high ground on our right fell away to the north-west, and the feeling of being "at sea" became strong; having no maps we could not check our position with regard to distant villages, &c., but our "dead reckoning" of trots, which on the level roads we were following was almost a certainty, gave


14' metal
To Appledore
From New Romney
20' metal (good)
To Hum Street 4 miles
15' metal
21 Ricks, wheat.
15' metal
South 85° West.
15' metal
10' gravel (bad)
15' metal
10' gravel
Large Farm
15 ricks. wheat.
16' metal.
To Bilsington 2 miles
Newchurch.

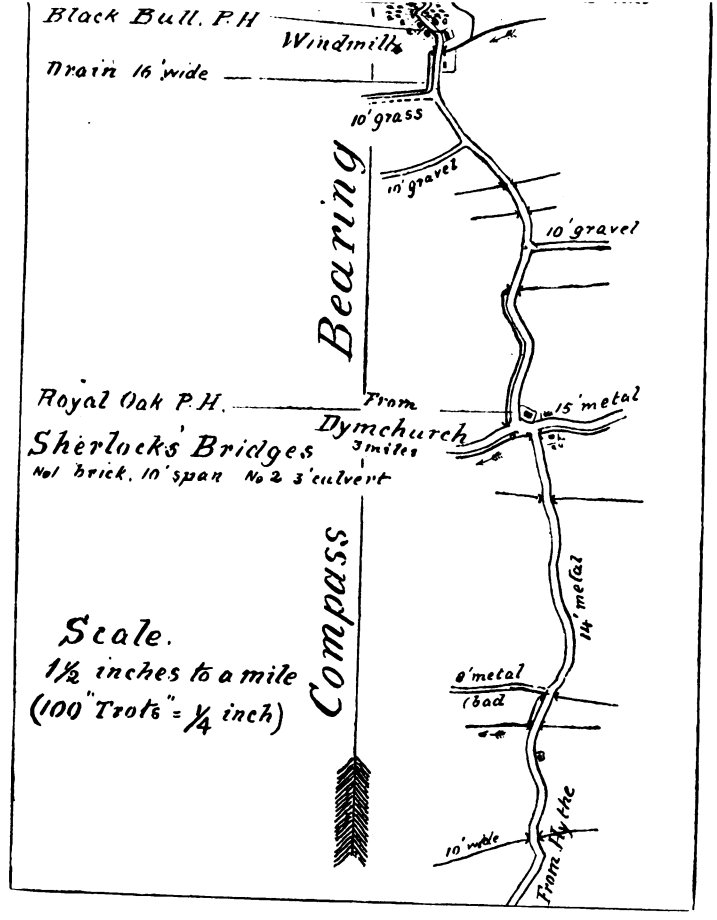


FIG. 24.—Example of a March and Reconnaissance Sketch on a Compass Bearing.

us a good idea as to the amount of ground we had covered and consequently as to how much lay before us. Generally speaking it was very difficult to get any really good long forward bearings by reason of the trees and hedgerows obstructing the view, and when we did succeed in doing so on one or two occasions, the road rendered our efforts fruitless by quietly bearing away to the opposite side of our line of advance. The method we adopted as to our choice of routes was that whenever the road we were following bore away too much to the right or left of our bearing, we took the first turn which would bring us back to it. Of course, working in this fashion it was plain that now and again a wrong road would be taken and which gradually became worse and worse until the metalling died away altogether, and we found ourselves in imminent risk of ending our sketch in a farm-yard. On these and similar occasions, either by retracing our steps to the last cross-road or turning or by making a cast to a flank along some farm-track, we were enabled to pick up a road better suited for the movement of troops.

After some very tedious work we reached Appledore, having covered the distance, some fourteen miles, in three and a half hours, a rate of four miles an hour.

The nett result of our reconnaissance was that a fair road averaging about ten to fifteen feet metalled could be followed right across from Hythe until within about two miles of Appledore, where it ran into the main Romney road. The greatest deviations we made from our compass-bearing were lateral distances of 1,500 yards on the north side and of 1,700 yards on the south, both caused by the eccentricities of the Marsh roads.

Since there was little or no detail to be sketched in, and the information required as to the roads could be shown on a small scale, we adopted that of one and a half inches to a mile, which at a rate of 600 trots to the mile, gave 100 trots to a quarter of an inch, measured off our foot-rules. The distances were well kept on this occasion, the section of the road between Sherlocks Bridge and the Ham Street cross-road, as shown on the sketch, being within 100 yards of the correct length, another instance of the regularity of the "scale of trots."

It is satisfactory to record that the utility of this reconnaissance has since been put to a practical test, and that the route reconnoitred on this occasion has been used by a portion of a regiment of cavalry on the march from Shorncliffe to Brighton *viâ* Rye

with the verdict that "an hour was saved" by adopting it; the original sketch (of which Fig. 24 represents a portion) being the only guide which was used to indicate the line to be followed.

In reconnaissance work not only should a man seek to train his perceptions so that he may acquire a facility for rapidly taking in everything affecting military operations, but he should seek to be ready at all times to seize and turn to his advantage any adventitious aid for carrying out the work. It would be impossible to attempt to lay down precisely how, when, or where, such aid might be expected to be obtained, since the same thing which one man would turn to advantage might be considered of little use by another. There are, however, certain everyday objects which are met with in a civilized country which, with a little care, can be made to afford great assistance to the military sketcher.

First and foremost amongst these may be reckoned railways, with their usual adjunct of telegraph lines. In the reconnaissance of a position, a bit of railway line traversing it is an invaluable aid, especially when contouring the sketch. In the event of the line being level, it affords a certain *datum* whence to reckon the contours at various parts of the sketch; and where there are cuttings or embankments, the relative positions of the contours next above and below the railway line can be fixed with great accuracy. Should the line be on an incline, say a gradient of 1 in 100, it is plain that there will be a rise or fall of 20 feet (or a normal contour at a scale of 6″ to a mile) in 2,000 feet or some 670 yards. In this case it only requires a little attention as to one's distance along the railway at any time from the point which was taken as the *datum*, to ascertain the precise position of the contour above or below.

A useful way of ascertaining the exact gradient of any steep bit of road passing near buildings is to note the distance in which any horizontal line of masonry, such as the coping of a wall, rises to any given height from the ground. Thus, supposing that a certain course of bricks starting from a point level with the ground at the end of twenty yards was seen to be about twenty-four courses above it, the gradient would be (allowing four courses to a foot) about $\frac{1}{10}$ or a slope of 6°. Or again, if a course of masonry were noted to rise from the level of the ground to that of one's eye, the gradient can be ascertained as follows. Assuming that the height of a man's eye when mounted is 7 feet 6 inches above the ground, or when dismounted 5 feet 6 inches; this rise

in 15 yards would be in the first instance at a gradient of $\frac{1}{6}$, and in the latter $\frac{1}{8}$. Similarly, when ascending a steep embankment fenced with posts and rails, such as sometimes conducts to bridges over a line of railway, the gradient may be found by noting the relative levels of the posts; thus with posts 3 feet high and 9 feet apart, if the top of one post were observed to be on a level with the foot of the second post from it, the gradient could be taken as $\frac{1}{6}$.

It is a very useful thing when engaged in any work of this sort to know the exact height of one's eye above the ground, both when on foot and when mounted, say, on a horse standing 15·2, as in the latter case, allowance can be made for the difference due to being mounted on a bigger or smaller horse. The gradient of a road or slope of a hill can then be worked out by noting where the level of the eye strikes the ground and measuring the distance to that point.

This process is also exceedingly useful when sketching without any clinometer and it is desired to contour a piece of ground with approximate accuracy. Supposing the height of the observer's eye to be 5 feet 6 inches above the ground, this observation four times repeated would about give the interval for twenty-foot contours; or, assuming the observer to be mounted, and using thirty-foot contours for his work, four times the height of his eye from the ground would give this interval fairly well.

It is also very useful to know the distance between the finger-tips of one's extended arms, also the span between one's thumb and second or little fingers. These are of good service for measuring piers of bridges, timber, &c., when no foot-rule happens to be available. The habit of being able to pace yards with accuracy is, of course, more than ever of importance where measurements of such details as the above are required.

Most men who are practised at field-sketching have various plans of their own for roughly estimating measurements of bridges, buildings, cuttings, &c. A good useful method as regards the span and height of bridges overhead is to note how many horses' lengths go to the former, or how many times the height of a mounted man goes to the latter. If a man be sent on ahead to a bridge with orders to rein his horse across the roadway, it will be found that the measurements can be estimated fairly well, from a little distance. This method of measurement by horse's lengths of course applies to any road which it is desired

to report upon and saves the trouble of dismounting and pacing its width.

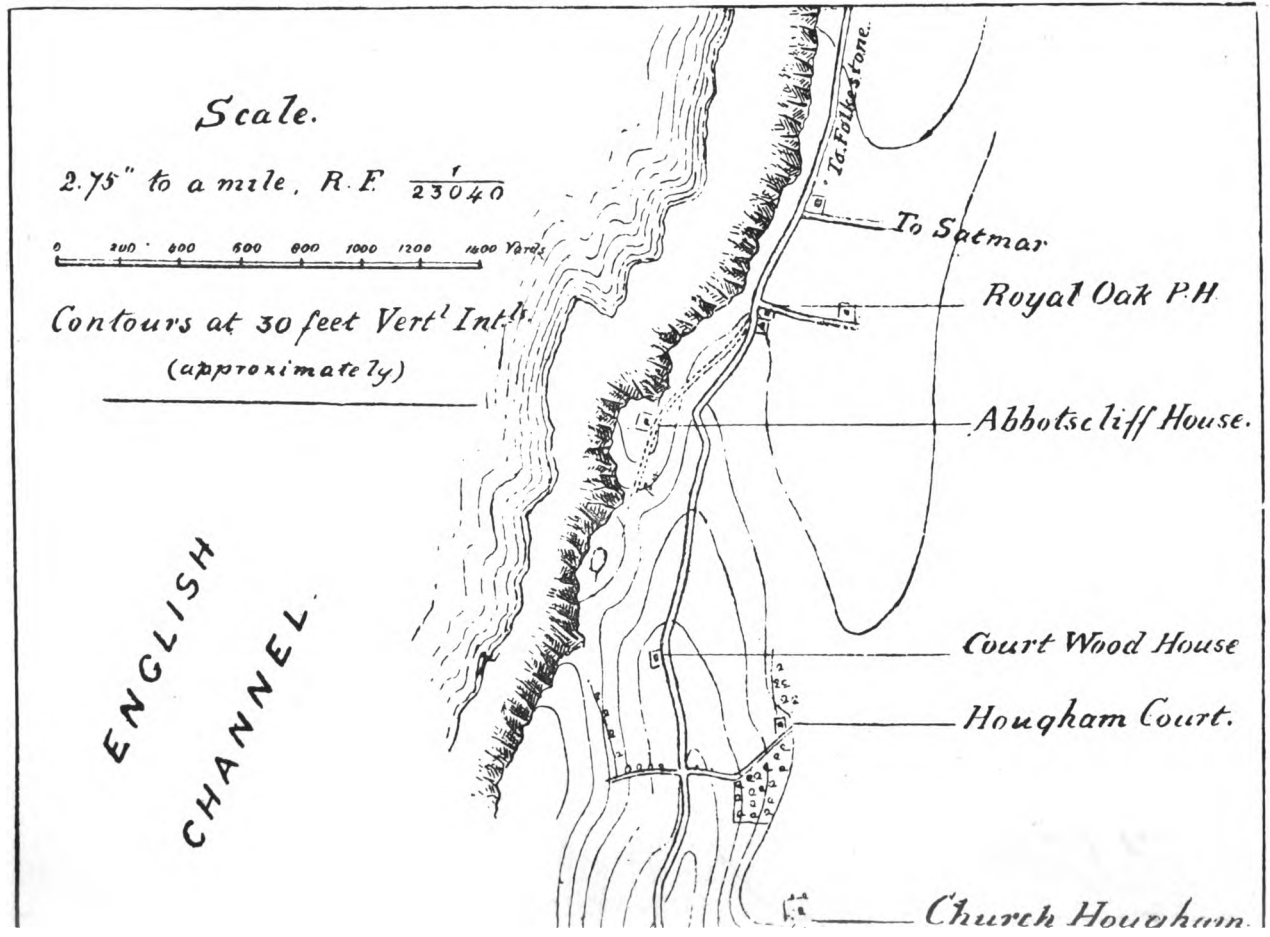
In the case of railway bridges the span can frequently be estimated with accuracy by noting the relative distance of the piers of the archway from the outer rails on either side; the space occupied by the lines of rail being of course a definite quantity dependent upon whether the line be broad or narrow gauge, double or single.

It is often possible to closely estimate the width of railway cuttings or deep sunken roads with wooded banks, by asking oneself the question, "Would a pheasant be within shot crossing that bush or fence?" Or again, as regards the width of a river or pool, "Would it be possible to fetch down a duck rising out of those rushes on the far bank?" the natural sequence to these questions being "Would these be near, medium, or long shots?"

It would be easy to give many more examples, but, as has been already said, these had better be found out and utilized by each individual according to his own lights. I will, therefore, only describe one sketch executed in what may be termed an irregular manner, in so far that the reckoning of the distances in place of being made by a man's or horse's paces was dependent on the interval between telegraph poles.

On the occasion in question, we were on the return march from a reconnaissance on Deal, and on reaching the Folkestone road clear of Dover, the party was instructed to make a rapid sketch of the road on the way back to Camp, using the telegraph poles as a scale for sketching. Trotting our horses along the road, we found that the distance between two poles averaged about twenty-seven "trots." This gave an interval between the poles (allowing thirty-three trots to be equivalent to one hundred yards) of about eighty yards. We next settled that our sketches should be, as near as we could make them, on a scale of three inches to a mile.

It now remained to find out what divisions of our foot-rules could be utilized for the work in prospect. Reckoning that the poles were all at intervals of eighty yards, it was plain that there would be twenty-two to the mile, and that on a scale of three inches to a mile, there would be between seven and eight telegraph poles to an inch. For simplicity of reckoning we assumed that eight poles would go to an inch, this, of course, enabled us to


Scale.
2.75" to a mile, R.F. 1/23040
0 200 400 600 800 1000 1200 1400 Yards
Contours at 30 feet Vert.l Int.ls.
(approximately)
ENGLISH CHANNEL
To Folkestone.
To Satmar
Royal Oak P.H
Abbotscliff House.
Court Wood House
Hougham Court.
Church Hougham

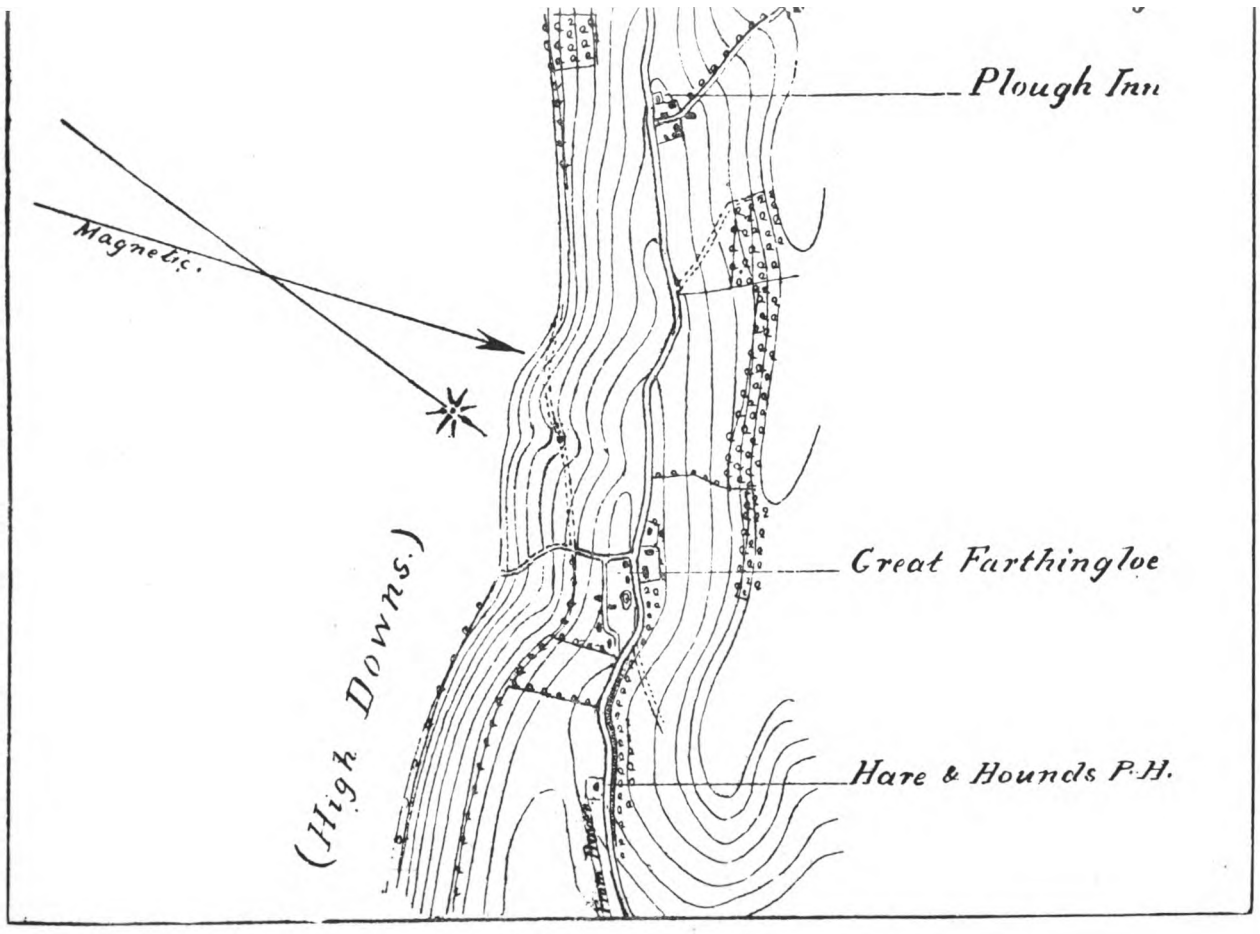


FIG. 25.—Example of a Sketch on Horseback. Distances reckoned by the Telegraph Poles along a roadside.

use each division of one-eighth of an inch as representing the distance between two poles.

Naturally, the immediate result of this approximate method of reckoning distances was to cause our sketches to be executed on a smaller scale than three inches to a mile since we reckoned twenty-four poles as going to three inches in lieu of twenty-two, in other words we got 1,920 yards represented by three inches in lieu of 1,760. The scale thus evolved was 2·75″ to a mile.

Having settled these preliminaries (which it took considerably less time to do than to thus describe), we set to work. The forward bearings were taken in the usual manner when required, and the distances between each successive halt were marked off by reckoning the telegraph poles. The distance and elevation of the crest lines of the hills bordering either side of the valley in which lay the road were estimated by eye from time to time. Advantage was also taken of conspicuous objects on one or two occasions to check these estimated distances by intersection. The gradient of the road was also reckoned by eye, the process of judging the slope of each section of it, being where possible, checked by a second estimation of the general rise in a long stretch of ground.

As regards time of execution this sketch was exceptionally rapid, owing to the very small amount of detail to be sketched in, and also to the largeness of the "units of distance" as represented by the telegraph poles. It may be mentioned that there are several discrepancies in the accompanying sketch (Figure 25), more especially as regards the configuration of the hills, but it should be borne in mind that it would be out of keeping altogether with a rapid reconnaissance sketch of this sort to attempt to accurately delineate the numerous spurs, &c.

All that was sought to be expressed in the sketch was the fact that the road lay in a deep valley, fairly level along its water-course, but bounded on either flank by extremely steep hills.

CHAPTER V.

SKETCHING BY TIME.

General Description of the Process.—Method of keeping a Record of Distances traversed.—Necessity of carrying Watch on Wrist.—On what occasions Time-sketching would most usually be adopted.—Absolute Necessity for it under certain Circumstances.—Country most adapted for its Employment.—Most suitable Rate of Advance.—Examples of Sketches by Time (1) Without the aid of Maps, Wady Halfa to Dongola, Time Scale for Camel Riding; (2) With the aid of Maps, Sir Herbert Stewart's Desert March.—Distances reckoned by average Rate of Advance of Column.—River Reconnaissance made on one of Gordon's Steamers.—Distances reckoned by Rate of Steaming.—Concluding Remarks.

THIS branch of Field Sketching may be briefly described as a method of working in which the usual records of distances obtained by counting a man's or horse's paces, are replaced by measurements representing the amount of ground covered in a given interval of time. For example, if the rate of advance were three miles an hour, divisions of ten minutes might be taken as the units of measurement, and these would represent half-mile intervals. The scales required for time sketching are, under ordinary circumstances, extremely simple, and when once the average rate of advance has been ascertained, and provided this rate of advance be an *uniform* one, all that is required is to rule lines across the sketch to represent the intervals of time (and consequently the distances) which it has been decided to take as a basis for the work. Thus, when sketching on a scale of 1″ to a mile, and at a rate of advance of three miles an hour, parallel lines drawn across the sketch one inch apart will divide it into sections representing twenty minutes' march, that is to say, intervals of one mile.

In order to keep an accurate record of distance it is well to note in the margin the hour at which each of these lines is reached; thus, in the foregoing example, suppose the force marched off at 8 A.M., and continued to move at an uniform rate until 9.10, when a halt was called for thirty-five minutes, the advance being subsequently

resumed; the marginal notes to the lines would be as follows:—8, 8.20, 8.40, 9, 9.55, 10.15, 10.35, &c. So much for an uniform rate; next, take the more usual case of a force moving at a variable rate. In this instance it is best to decide upon about three rates, namely (1) ordinary, (2) slow, (3) very slow, and to prepare the straight edge for use by marking off along it a few of each of these measurements. Supposing as before that the ordinary rate of advance were three miles an hour, two and a half miles might be assumed as the "slow" rate, and two miles as "very slow." Working on the same scale, viz. three inches to a mile, this would give us 1″ as representing twenty minutes at the ordinary rate; $\frac{5}{6}$ inch, twenty minutes at the "slow" rate; and $\frac{2}{3}$ inch, twenty minutes at the "very slow" rate.

It is hardly necessary to point out the advantage of the one-inch graduations on the head-piece and foot-piece of the sketching-case when working in this fashion; they admit either of the sketch being divided into the required subdivisions by ruling lines across it, or they can be used to guide the eye in marking off a variable rate of advance, in which case the ruler need not be prepared for this purpose.

To carry out this process of sketching by time, with any degree of comfort, it is *indispensable* that the watch should be carried on the right wrist. The sketching-case being strapped to the left wrist and the right hand engaged in sketching, it is plain that it would cause endless trouble were it necessary to be constantly returning one's pencil to the hold-all and pulling out one's watch.

As with ordinary sketching, this "time sketching" had best be considered under the two headings of working with and without the aid of maps. In the former case, the "time" is used as a measurement to check one's position approximately, and note the rate of advance when possible; in the latter it is the basis of the record of distances, and, as has been already shown, is used in lieu of a scale of paces.

There are naturally an almost indefinite number of means of locomotion where "time sketching" would be of value, but I shall confine my remarks to one or two classes of the work with which I have had personal experience, leaving it to any enterprising man to work out any others according as the exigencies of any particular situation demand. The *principle* of all is, of course, the same.

First, as to the occasions when time sketching would most commonly be resorted to in preference to the usual method. It is

essentially adapted for a man who for various reasons is compelled to move at or about the same rate as a force on the march, whether it be horse, foot, or anything else. Further, it is especially useful when the work is continuous, that is, continued all day long, and from day to day, on the line of march. When the work is not thus continuous, it is plain that a record of distances could be more accurately kept by one of the methods already described, but with a force on the march, it is most difficult for a man to keep an unceasing count day after day of the distances covered by means of any system of reckoning either of his own animal's paces or of those of his escort.

As far as my own experience goes, as regards extended reconnaissances carried out on the counting system by reliefs, I have come to the conclusion that even one day's work of fifteen miles reckoned by "trots" is quite enough at a time for anybody who has any especial desire to keep his head clear for other work. A man so engaged is, so to speak, good for nothing else; any detour he may make to examine or reconnoitre any particular point, or to perhaps obtain some important topographical information, is certain to throw him out of his reckoning; and he is, during the greater part of the day unable to speak or be spoken to by anybody, even on matters of vital importance, without running the risk of losing the tally of his "counts." Even with well-trained men acting as "counting reliefs," it is plain that any deviation from the main line of advance will throw out the reckoning altogether. Hence the obvious advantage, and indeed the absolute necessity, of some sort of a system for "time sketching."

Naturally in an enclosed country like England, where there is such an unending mass of detail to be shown on a sketch, this class of work appears to its least advantage, since the delay caused by the numerous observations for the "forward bearings," and also by any attempt to delineate all the intricacies of such a country, would inevitably cause the sketcher to fall to the rear and get in the way of the column. It is therefore more adapted for use when accompanying a force moving through an open country; when the sketcher (who would of course be mounted) could always work on a flank if delayed and trot ahead when necessary, and at all times use the rate of advance of the column as his scale for distances.

When accompanying a body of cavalry which was moving at the "trot and walk," it would not be possible for the sketcher to

do more than take the very roughest notes on a skeleton route, except in a very open country where there was little to record and where the forward bearings were of considerable length. It is then with troops moving at a rate of not more than four miles an hour that this work comes in with best effect.

I shall now describe in detail the process of sketching by time, which I adopted in Egypt and the Soudan in 1884–85; first, when with a small party, and, in consequence, able to regulate the pace, but without the aid of a map; and, secondly, when accompanying a large force and reckoning the distances by its rate of advance, checked from time to time by the aid of a map. A reconnaissance sketch made of the route from Wady Halfa to Dongola, is an example of the first case. At the date of our start it was impossible to obtain one of the Intelligence Maps, which were subsequently so abundantly issued, so that we had very little notion of the country ahead of us. Since, however, the scale of these maps was only sixteen miles to an inch, it is obvious that there was little information to be obtained from them beyond a general idea of the course of the Nile and the bearing of the line of advance for each day's march. The route followed as a rule the right bank of the river, but now and again led across the desert so as to cut off any extensive bend. It was thus impossible to adhere to any magnetic bearing of the general line of direction to Dongola, and the working meridian had, in consequence, to be adjusted for each day's work. The only way we could ascertain the direction of the day's march was by asking the natives to point it out, and it speaks well for the "bump of locality" of the Arab, that I was able to adjust my meridian correctly day after day by following their directions; in fact, I only "ran off my board" twice in the whole march.

The distance from Halfa to Dongola, along the route sketched (and which was subsequently followed by most of the troops proceeding by land to the front), was estimated at 238 miles. Having decided to sketch on a scale of one inch to a mile (and which, by the way, events proved to be unnecessarily large), it remained to determine the rate of advance of our camels. There was no time for any very careful testing of this, but by timing them between the milestones alongside the railway to Sarrass, we estimated that the baggage-camels covered two and a half miles an hour and the riding camels three and a half to four. This calculation turned out to be rather over the mark—in fact, nearly 8 per

cent., the error being chiefly caused by the bad state of portions of the route, which retarded the rate of advance to a much greater extent than we were at the time aware of.

At a scale of 1″ to a mile, the distances covered in fifteen minutes are shown in the accompanying table :—

Time Scale for Camel-riding.

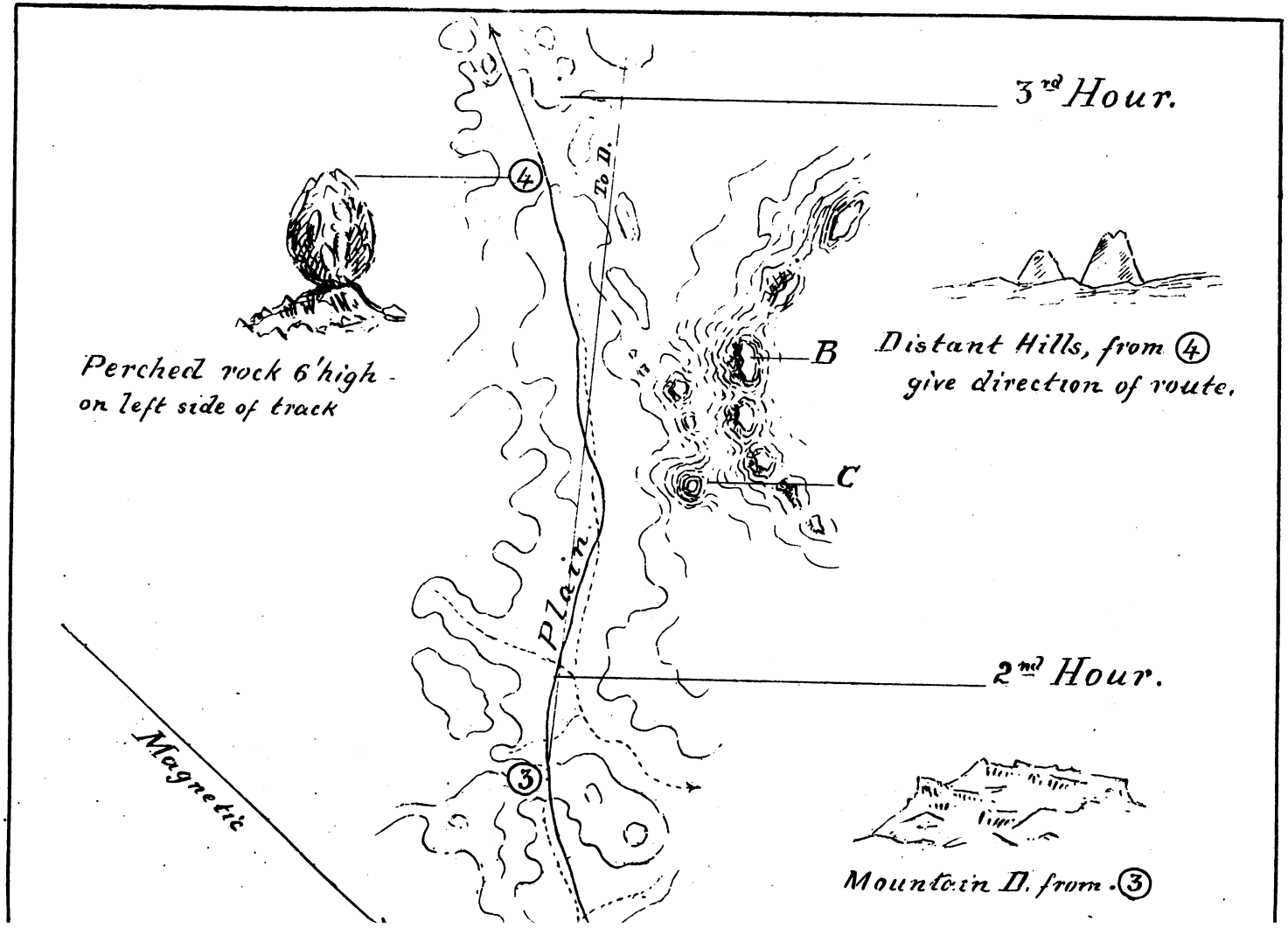
Scale of sketch 1″ to a mile.

15 minutes' march, at rate of 4	miles an hour, represented by	1″
15 minutes' march, at rate of 3½	miles an hour, represented by	⅞″
15 minutes' march, at rate of 3	miles an hour, represented by	¾″
15 minutes' march, at rate of 2½	miles an hour, represented by	⅝″
15 minutes' march, at rate of 2	miles an hour, represented by	½″

The method of working was as follows :—Having ascertained the general direction of the first portion of the day's march, a forward bearing of it was taken, as far as could be seen. Bearings of any conspicuous hills which appeared to lie somewhere near our line of advance were then taken, and if there was reason to believe that the road bore away to a flank, the direction of any hills, no matter how far distant, was noted on that side. Rough, but accurately outlined, freehand sketches of these various hills were then made on the margin of the paper, and distinguished from one another as "Hill A," "Mountain B," &c., and along the lines which indicated their several directions was written, "To Hill A," &c. It was thus possible to identify each of them later on if necessary.

The detail about us was then drawn in by eye in the usual manner, especial attention being directed to the dry watercourses, or "wadies," which, by the way, I invariably marked with a dotted line in blue chalk, so as to emphasise, as it were, their position. At the end of every fifteen minutes, or thereabouts, an inch was marked off along the route, if going at a "jog" of four miles an hour; or ⅝ inch if going at a walk, and the detail was drawn in as shown on Fig. 26. As the actual course of the route became apparent, the landscape sketches of the hills which proved to be distant from it, and were not useful as landmarks, were erased, only those which either served as points to march upon or near to which the camel track passed being retained.

As a rule but few forward bearings were required, the country being generally very open and undulating. It should be remarked


3rd Hour.
4
To D.
B
C
Plain
2nd Hour.
3
Magnetic
Perched rock 6' high
on left side of track
Distant Hills, from 4
give direction of route.
Mountain D. from 3

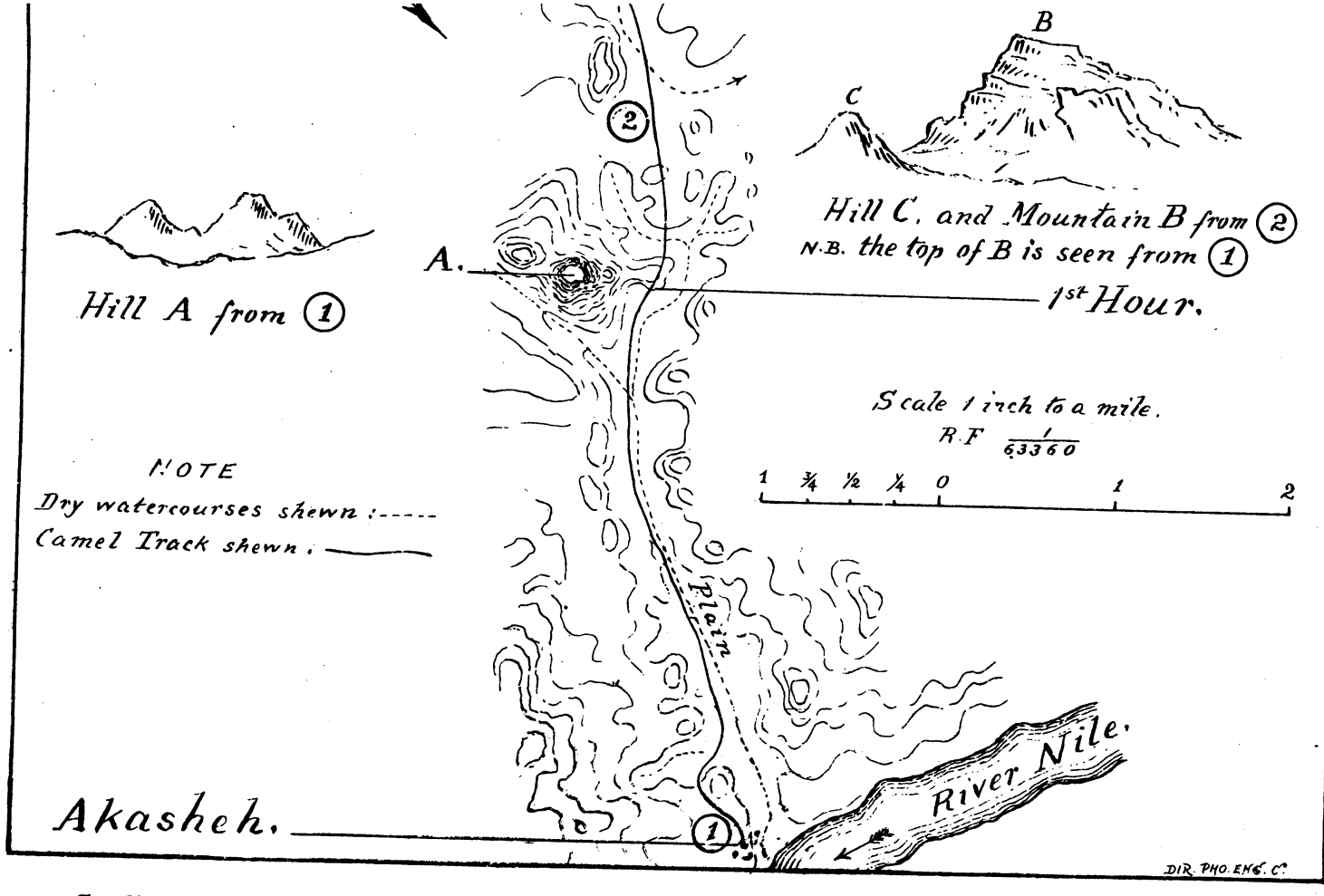
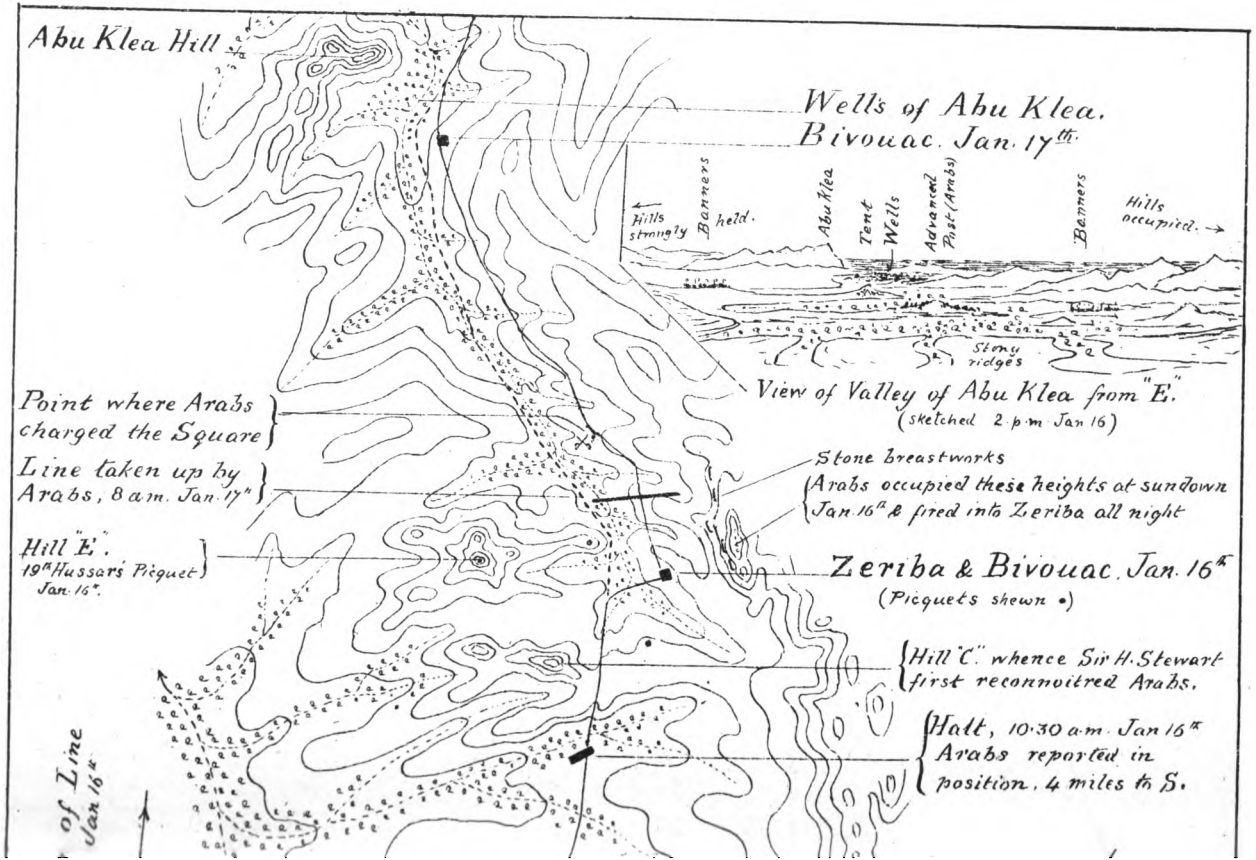


Fig. 26.—Portion of Sketch of Route from Wady Halfa to Dongola, executed on camel-back, "without the aid of Maps." Distances reckoned by Time.


Abu Klea Hill
Wells of Abu Klea.
Bivouac. Jan. 17th.
Hills strongly held.
Banners
Abu Klea
Tent Wells
Advanced Post (Arabs)
Banners
Hills occupied.
Stony ridges
View of Valley of Abu Klea from "E."
(sketched 2 p.m. Jan 16)
Point where Arabs charged the Square
Line taken up by Arabs, 8 a.m. Jan. 17th
Hill "E".
19th Hussars Piquet
Jan. 16th.
Stone breastworks
Arabs occupied these heights at sundown Jan 16th & fired into Zeriba all night
Zeriba & Bivouac. Jan. 16th
(Picquets shewn •)
Hill "C" whence Sir H. Stewart first reconnoitred Arabs.
Halt, 10.30 a.m. Jan 16th
Arabs reported in position, 4 miles to S.
of Line
Jan 16th

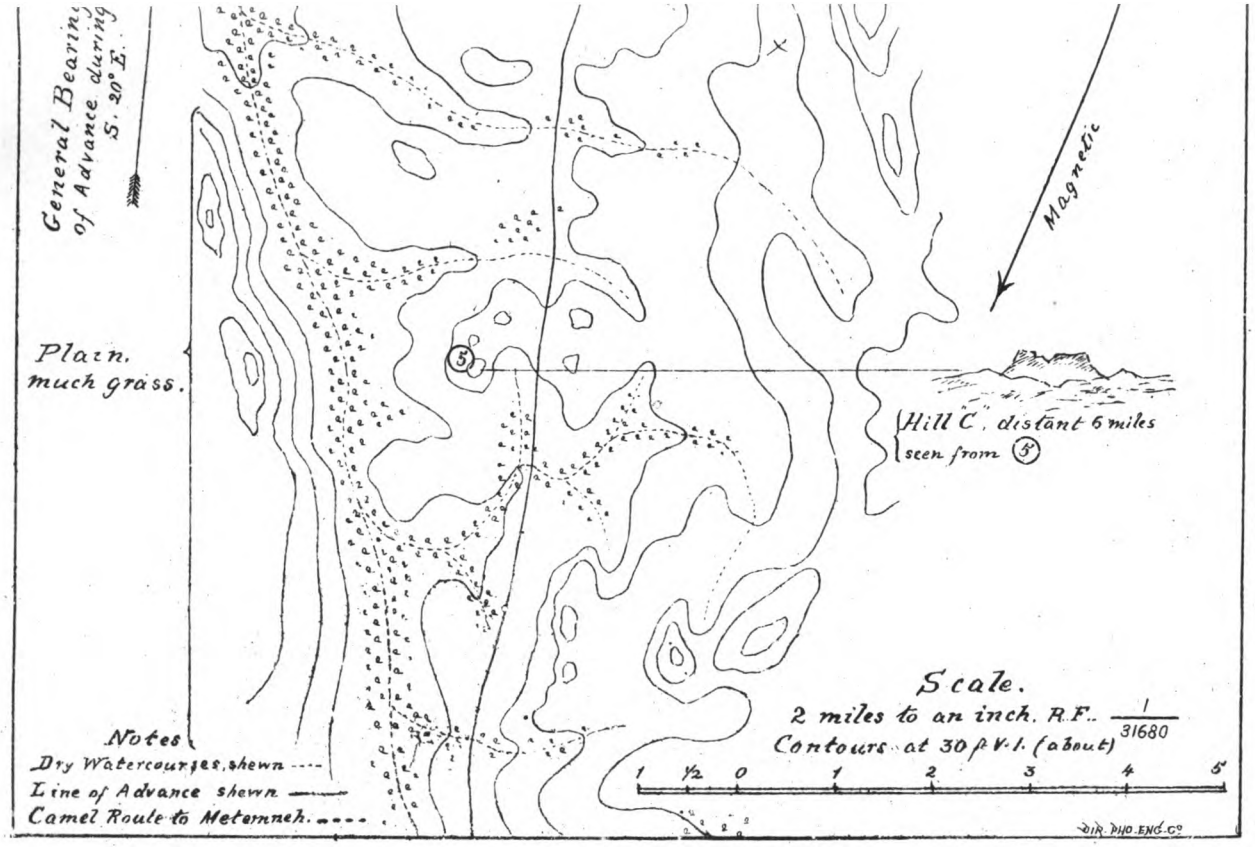


Fig. 27.—Portion of "Sketch with aid of Maps," executed by "Scale of Time" during the March across the Bayuda Desert, January 1885.

here that the rough "form lines" showing the hilly ground in Fig. 26, are not supposed to represent contours. At the end of each hour's march (exclusive of halts, except, of course, for drawing purposes), a line was drawn across the paper and the time noted. When finishing up the sketch, each hour's march was numbered off, counting from the start in the morning.

Working in this manner it was easy to sketch about thirty miles a day; a limit, however, was placed on our rate of advance by the slow pace of the baggage camels, and thus it came to pass that it was rarely possible to do more than seven hours' sketching (about 42 miles) in a day without giving the baggage camels too long a march.

An example of a sketch of which the detail was drawn from a scale calculated by the rate of advance of a large column of troops, was that executed during Sir Herbert Stewart's march across the Bayuda desert. It has the advantage of being accurate as to distances since it partook of the nature of sketching with the aid of maps, inasmuch as we were supplied with an excellent map on a scale of about three miles to an inch. This had been compiled from the Soudan Railway Survey of 1872, and was not only fairly correct as to distances, but gave also a section showing the levels of the projected line to Khartum. Being, however, thus taken from a survey made for purely railway purposes, the hills were only indicated by a few vertical hachures, and hence there was plenty to do in the way of sketching. The great advantage derived from the map was unquestionably the elimination of all serious error as to distances, since it was easy to check one's estimated measurements at certain well-defined points; further, the sections and levels enabled the contours, rapidly drawn in by eye, to be connected, and thus to impart a very good idea of the nature of the ground. At the same time it must be borne in mind that it was out of the question to draw contours with any accuracy at such a small scale as two miles to an inch, hence the contours should be viewed as being more of the nature of "form lines" than anything else. The rate of advance of the column of some 2,500 camels was exceedingly uniform when moving by day, and thus formed an excellent and almost infallible means of checking one's position at any given moment when not near a point readily recognizable on the map—a matter of daily and hourly occurrence.

Thus on the ground depicted in the accompanying sketch there was little or nothing to guide the eye on the map from our start early on the morning of January 15th until our halt at 10.30 A.M.

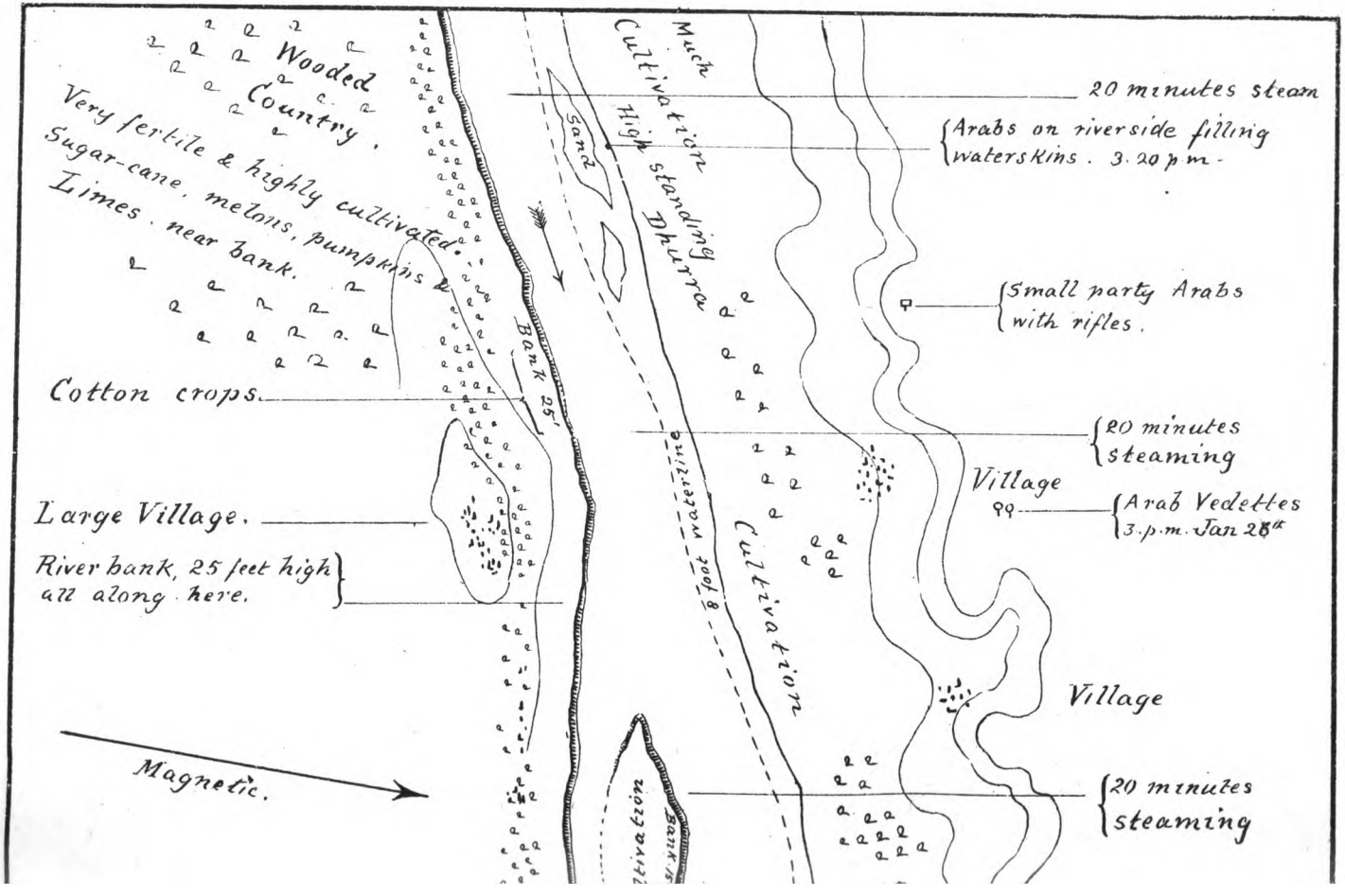
The position of any of the detail shown on the sketch between these points being reckoned entirely by "time." The accuracy of this method of measurement under favourable circumstances was well exemplified by this day's march. We had moved off from our bivouac at 5 A.M., and allowing an average of two miles and a quarter for each hour's march, we reckoned we had covered twelve miles when the halt was called. The map showed this to be the distance between the south slope of Gebel es Sergain (our bivouac on the 15th) and our halting-place below the range of hills at the head of the valley of Abu Klea; in other words, in the parlance of surveyors, our sketch had "closed" on the forward station.

As a last example of the varied circumstances under which this process of "time sketching" can be utilized, an illustration has been given of a portion of a river reconnaissance made from one of Gordon's steamers on the Nile between Metemneh and Khartum.

In this instance the rate of advance on land was replaced by the number of knots per hour made good by the steamers against the stream. From observations made from the steamer when passing a measured distance close to our river fort, it was estimated that the "*Safia*," as she was called, usually steamed about three knots an hour against the current. This gave one knot or about 2,000 yards for twenty minutes' steaming in the open reaches of the river, and, of course, considerably less where the channel narrowed or the current swept round a point. The calculation of distance was thus obviously exceedingly rough and required a certain amount of careful judgment; but as we made several trips up this portion of the river, and calculated the distances both up-stream against the current and running down-stream with it, we were able to check them fairly well.

At a scale of $1\frac{1}{2}$ inches to a mile, $5\frac{1}{4}$ inches represent an hour's fair steaming; taking three knots as equivalent to 6,000 yards. The scale of time was $1\frac{3}{4}$ inches for twenty minutes' steaming approximately.

Owing to the amount of iron to be met with all over the steamer, which was armoured with boiler plates, &c., it was not an easy matter to use the compass in the sketching-case, so it was frequently necessary to have recourse to setting the sketch by the back "traverse line" of our course up-stream. Advantage was taken of our landing at various points to check the forward and also the back bearings of the course of the river, also to get information as to villages, crops, cattle, &c.


Wooded Country.
Very fertile & highly cultivated.
Sugar-cane, melons, pumpkins & Limes. near bank.
Cotton crops.
Large Village.
River bank, 25 feet high all along here.
Magnetic.
Bank 25'
Sand
High standing Dhurra
Much Cultivation
Cultivation
Water 8 feet
Cultivation
Bank 25'
20 minutes steam
Arabs on riverside filling waterskins. 3.20 p.m.
Small party Arabs with rifles.
20 minutes steaming
Village
Arab Vedettes 3.p.m. Jan 28th
Village
20 minutes steaming

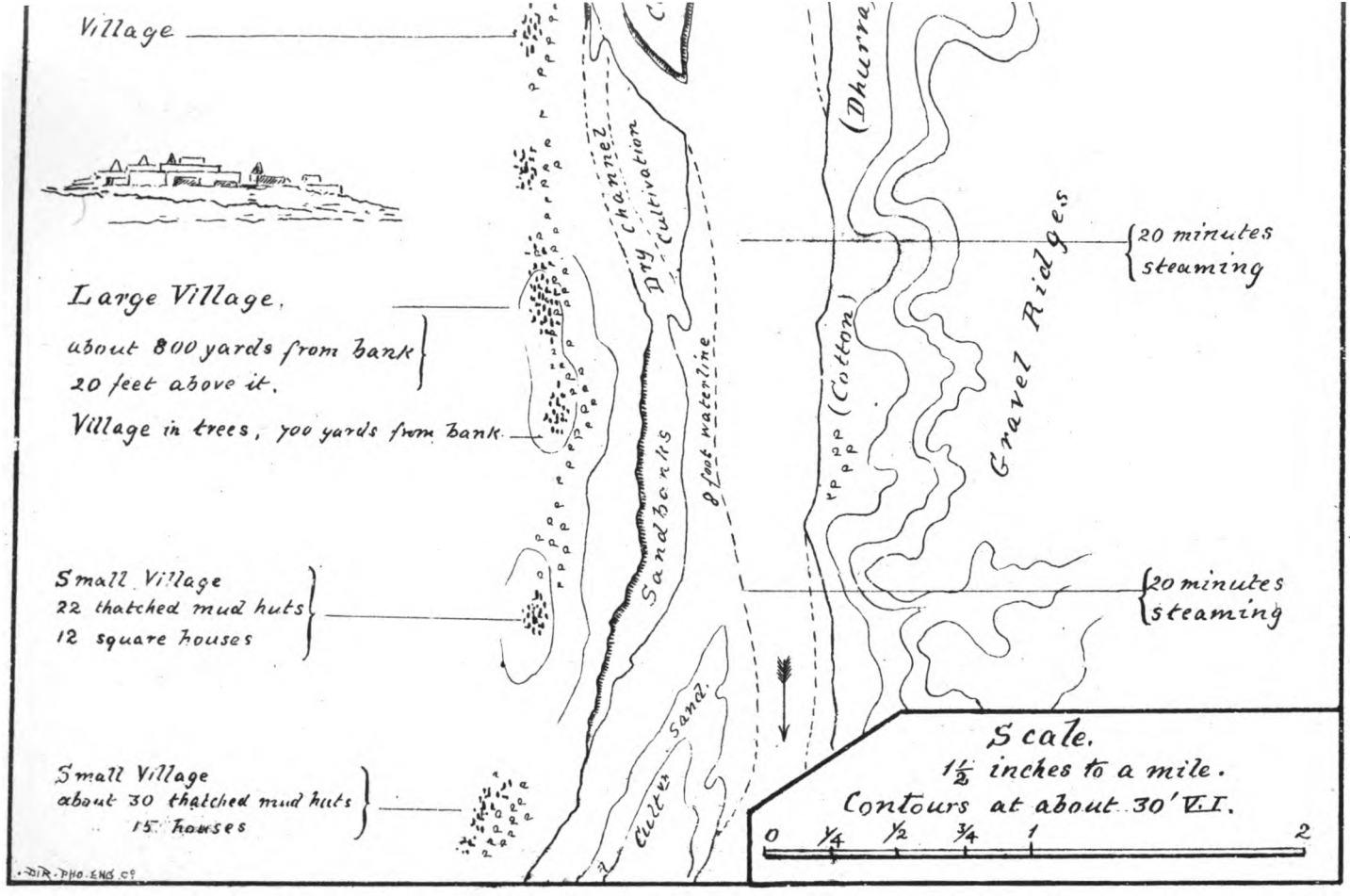


Fig. 28.—Portion of River Reconnaissance executed when on board one of Gordon's Steamers. Distances reckoned by Time, "without the aid of Maps."

The three last examples relating to "time sketching" have been, perforce, taken entirely from my experiences in the Soudan, since, as a matter of fact, I have very little knowledge of such work in any other country. It is a class of sketching which does not accommodate itself well to England, since when provided with a map in this country it is possible to pick up one's place at any moment by reason of the easily recognizable cross-roads or other features. On the other hand, when working without a map, the fact of being confined to a line of advance along a high road which *must* be followed under all circumstances, renders some system of recording paces preferable to time sketching. All the same, in most countries circumstances might easily arise when sketching by time would be a most valuable system to work upon, and, as such, the method by which it can be carried out should be borne in mind by all those who wish to be proficient in the art of rapid field-sketching under all or any circumstances, no matter how arduous or novel, in which they may find themselves placed on active service.

CHAPTER VI.

SKETCHING WITH THE AID OF A RANGE-FINDER.

The Difficulties of Sketching when Reconnoitring.—Ordinary Methods not always possible.—System of Range-finding combined with Sketching.—Value of a portable Range-finder to an Officer engaged in Reconnoitring.—Examples of Sketches made with aid of Range-finder (1) from two points, (2) from one point only.—The Cavalry Sketching-case used as a Plane Table.—Description of Tripod Stand.—Example of a rapid Reconnaissance Sketch of a large extent of country made with these Instruments.—Conclusion.

In any reconnaissance work in a hostile country in close proximity to the enemy, and where, in consequence, he may be expected to be met at any moment, neither the system of reckoning distances by the paces of one's horse, nor by "time sketching," can always be depended upon.

In all scouting and reconnoitring, it is plain that the precise directions of any portion of a line of advance can rarely be foretold, or if known, can seldom be followed with sufficient closeness to enable an exact record of distances to be kept either by pacing or time.

The exigencies of any particular situation can alone decide whether a patrol shall move to the front, or make a flanking movement, or retire, and thus a record of distances based upon directions taken and paces counted may easily become so hopelessly mixed as to be useless. On the other hand the fact that the rate of advance of a patrol is necessarily varied to an unlimited extent renders any system of "time sketching" equally inapplicable. No doubt in some cases much can be done by aid of these processes used either separately or combined, but the difficulty will always remain that it is incumbent on the sketcher who employs them that he should advance by certain definite lines to the points he wishes to gain, irrespective of the tactical

advisability of such a proceeding. In other words, assuming that the reconnoitring officer has taken the direction of some point to his front which he wishes to occupy with a view to further observations, he is tied down to a direct line of advance at a certain pace from his present position to the point he has noted. Should he make any extended detour either on account of the topographical difficulties of the intervening ground, or because a direct advance across it would be sure to be observed and frustrated by the enemy, he at once runs every risk of losing all correct record of the distance either by scales of paces or of time.

It may be argued that it might be possible to establish the exact position of distant points in a hostile country by means of measuring a base line and fixing their positions by intersection. As a general rule, however, it may be safely stated that such an undertaking would rarely be successful or even practicable on active service. The whole method is so cumbrous and the various operations are so much connected together that, should the enemy detect (as he most certainly *ought*) any such undertaking, he has it in his power to interfere with it, and most probably to cause its abandonment before the second series of bearings were taken, and, in consequence, before any part of the *object* of the whole scheme had been accomplished.

Again, even assuming that the first stage of the operation had been successfully carried out, and that a base of sufficient length had been measured, and various commanding points in the enemy's country had been fixed by intersection, we are then faced by the problem of how to push ahead with the survey or reconnaissance thus commenced. It is plain that in order to do so, two at least of the most commanding points already fixed must be occupied, and that a fresh series of bearings must be taken from them to points in front. Also, that under ordinary circumstances it would be necessary for the same man to take the observations from each of the points; for unless this were done there would be every probability, and indeed in many cases a certainty, that the same objects would not be observed by two different people. There are also many practical objections to this process, the commonest being the constant difficulty which all surveyors meet with in getting a view of the points they wish to fix, from both ends of a base or from two stations. In most parts of England this is a constant source of annoyance and waste of time, as it commonly occurs that objects which appear

to be most conspicuous and easily defined from one point, are absolutely unrecognisable from another. Thus, when sketching and reconnoitring along a road it has frequently been my fate to expend considerable time in carefully observing the direction of some windmill, building, or tree, the position of which would obviously be of great assistance in sketching in the hills in the vicinity, and then subsequently finding it was impossible to obtain a second "shot" at them, and thus fix their position, owing to some aggravating accident of ground concealing them from view. But, besides the duty of reconnoitring in an absolutely hostile country, there is the case of an officer who, before hostilities have commenced, has an opportunity of traversing a portion of the ground destined to become eventually the scene of active operations. Here, again, an attempt to "triangulate" the country, accompanied by, in doing so, the necessity of occupying widely distant points, would almost inevitably arouse the suspicions of even the most unsophisticated of the population.

In view of the numerous small wars and expeditions undertaken by the British Army, in districts wholly unmapped as regards the tactical features of the ground, this process of obtaining topographical information is undoubtedly a most important one, and also one that, in spite of the difficulties and drawbacks attending its execution, has been carried out by enterprising men on various occasions with more or less success.

Taking, therefore, into due consideration the great value of being able at times to thus reconnoitre and sketch ground where opposition either from a military force or from the civil population might be expected, it remains to be considered what method should be adopted in order to command the greatest share of success.

The object of the present chapter is to call attention to an important branch of military sketching, which has from time to time cropped up and then died away for reasons sufficiently obvious; the branch in question is a system of fixing the positions of distant points by means of observing their directions, and then taking their distances by means of a "range-finder." The reason that this apparently simple process has never gained a position in military sketching is the very simple one that hitherto no portable range-finder has been available.

With an instrument of this nature, which fulfilled the ordinary common-sense requirements of a "Service Range-Finder" it is

evident that the relative positions of any number of distant points, with regard to an initial point and to each other, could be mapped out with ease.

This process could be carried out from some point in rear of the outpost line of sentries, in most cases, and especially on favourable ground, without exciting any attention on the part of the enemy. The second stage, and one which would require careful consideration in its planning and considerable skill and enterprise in its execution, would be the occupation of one of the points thus fixed, without unduly giving notice of the same to the enemy, and the observation of a new series of distances and directions from it. This process of seizing commanding points, the position of which has already been mapped out, and from them fixing a new series of points, is the one now advocated in preference to the more formal method of "triangulation" as usually understood, and as one which is more in consonance with the exigencies of modern warfare.

The various "stations" or points being thus fixed with a fair degree of accuracy, the intervening ground between them would be sketched in by eye, unless, owing to exceptionally favourable circumstances, it were considered worth while to "traverse" it with the cavalry sketching case.

It is plain that to carry out this class of work in its entirety and with most chance of success, the duty should be performed by an enterprising and skilful officer accompanied by a small body of cavalry. By careful scouting and a quick eye for ground, he would, after completing his observations at one point, move rapidly and by the most protected route to the next point he wished to occupy. Having arrived there and disposed of his men so as to enable them to keep a sharp look-out without exposing themselves to view, he would with all despatch take the directions and then the ranges of the next points, and, if time permitted, plot these off on his sketching-case. The general direction of the watercourses and watersheds might then be marked in by eye, and any matters of importance noted in the sketch.

The essence of the operation is undoubtedly rapidity, for the longer the party remained in one situation, the greater the opportunity for the enemy to observe them and take steps to cut them off. As to *how much* sketching could be carried out would depend entirely on the individual skill of the officer, coupled with

the enterprise of the party and the vigilance of the enemy's cavalry or scouting parties. Besides thus fixing various points by aid of the range-finder, many more on either flank could be, of course, fixed by "intersection" from the different range points.

The main advantage of thus mapping out roughly a hostile country over any system of keeping a record of distances or of time, is the virtually total independence of movement which it permits for the body of cavalry or infantry escorting the officer engaged in the work.

There is no restriction to any particular line of advance, and they are free to move anywhere or halt and remain concealed any time, keeping the main object always in view, viz. the occupation of one of the "forward stations" already fixed. To do this with success would naturally open up a large field for individual skill, quickness of judgment, and other soldierly qualities.

It is right to mention here that, as far as my own experience goes, the idea is a theoretical one, inasmuch as, as far as I am aware, it has not yet been tested on service in the field. Hence the examples given with this chapter are only taken from reconnaissances made at home, and I must leave it to others to draw their own conclusions as to whether the system is one which is likely to prove of advantage. It is recorded that during our operations in Zululand the position of various hills, &c. adjacent to the line of advance were fixed by a range-finder.

When in the Soudan I constantly felt the want of a range-finder, both for topographical and tactical purposes. It was, however, when we were confined to our river fort at Gubat, on the Nile above Metemneh, that the idea of reconnoitring and surveying by means of a range-finder struck me as being of such vast importance. At the time it was desired to reconnoitre and map out the ground around Metemneh, and we were met by the almost insuperable difficulty of ascertaining the distances of the hills and villages. The close proximity and activity of the enemy rendered any attempt at a direct line of advance on any point beyond our vedettes a matter of difficulty, although at times it was possible to move by circuitous routes along the valleys to commanding points whence fresh observations might have been taken and the ground thus roughly mapped out, had only the position of these points been fixed.

I am confident that many officers who have had experience of topographical work on active service can recall to mind numerous

instances when a reliable range-finder would have been simply invaluable to them, both from a technical and tactical point of view.

It is undeniable that the advantages of a good range-finder to a military sketcher are almost incalculable, more especially should he be engaged in the rapid class of work advocated in these chapters. Of course, the most important of these is the power which such an instrument confers on the observer by enabling him to fix the exact position of any number of points at any range within the limits of his eye-sight *from one point*, and without any intersections of stations, and the consequent necessity for leaving his original position.

To take an ordinary case; with the range-finder it is perfectly feasible to fix the position of any object at 5,000 yards or more, whereas to do so with any degree of accuracy by intersection would require a base of certainly not less than 2,000 yards, and according to the rules of surveying, one as near 5,000 yards as possible.

At conspicuous objects, such as church towers, tall chimneys, &c., the ranges can be accurately taken up to the limits of human eye-sight. Thus, a Martello tower, east of Folkestone, was taken with the "Weldon" as 4,900 yards from a point in Shorncliffe Camp, the correct range being 4,910 yards. Again, in India in 1884, the range of a well-defined object, distant 14,440 yards (or about eight miles), was taken as being 14,350, an error of only 90 yards.

In the preceding examples, it is evident that it would have been out of the question to find the ranges by intersection without embarking in operations which would have occupied much time, and it is not difficult to imagine occasions when it would be quite impracticable to carry out such processes at all, no matter how much time were available.

An officer engaged in a rapid survey of a country will find in a range-finder an excellent means of measuring a base of any required length.

One of the conditions universally laid down as a necessity for a good base, viz. that it should be free from steep slopes or obstructions, which naturally interfere and complicate the correct measurement of the distance by chaining, is of course entirely obviated by using a range-finder. It would be especially useful in the measurement of a base in a broken or a mountainous

country, where under ordinary conditions, the surveyor is restricted in the selection of his base to some small piece of fairly level ground, probably in a watercourse, and all too short for his purpose. The process of obtaining intersections of stations from either end of this short base, and then taking two of the stations thus fixed as the ends of the new base, is one familiar to all surveyors, but which nevertheless, occupies considerable time and entails much trouble as well as the necessity of very accurate work in order to be attended with any success.

It is hardly necessary to say that when working with the range-finder, a base can be accurately measured between any two points selected as convenient stations for the ends of the base, without taking into consideration the irregularities of the ground between them.

It may be reasoned that inasmuch as all range-finders at present in use require some sort of "base" for the taking of the ranges, that the stations for the ends of the base would have to be selected with this point in view, and that this might not always be convenient or possible. In reply I would say that even if the two stations thus selected were in such impossible ground as to prevent a correct range being taken from either, it is still perfectly feasible to take the distance between these two points with a *good* range-finder from some third point, whence the two in question are both visible.

Fig. 29 has been given as an example of a rapid sketch made of a portion of ground with a long base measured with the aid of a range-finder.

In this instance a convenient point was selected whence a good view could be obtained of two conspicuous points, namely, the church and the conical hill. The ranges of each of these objects were then taken from this point, and (by a simple process well known to users of the "Weldon" range-finder) the distance between the two objects thus ascertained. Two observations were made, the mean of these giving a range of 2,789 yards, the correct distance being about 2,780 yards. We then proceeded to the church, and from the summit of the tower, 40 feet from the ground, a "round of directions" was carefully observed with the cavalry sketching-case. The same operation was repeated from the top of the conical hill, and the ground sketched in as shown by eye, all the buildings, bridges, cross roads, &c. having been thus accurately fixed by good intersections.

Magnetic
Chiswell Hill

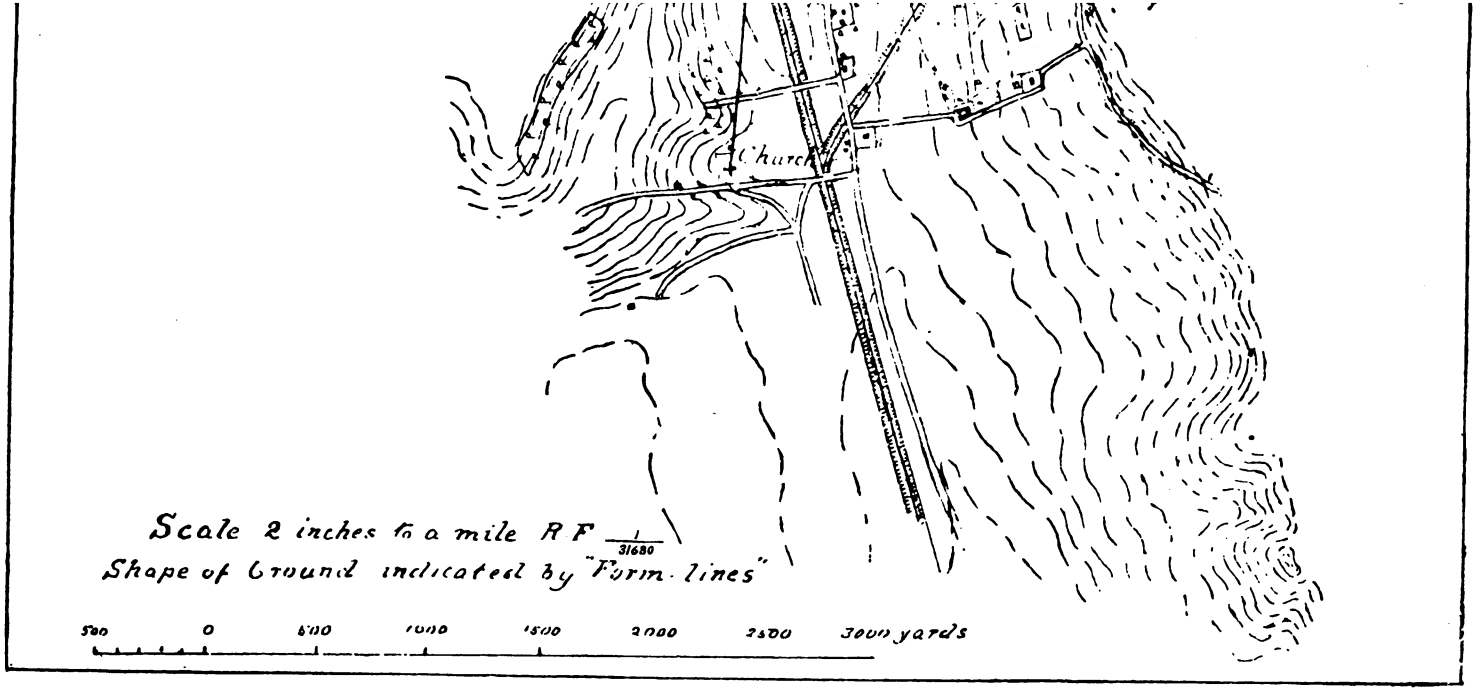


FIG. 29.—Rapid Sketch made with Cavalry Sketching-Case used as a Plane Table from two points. Base measured with "Weldon" Range Finder.

Magnetic

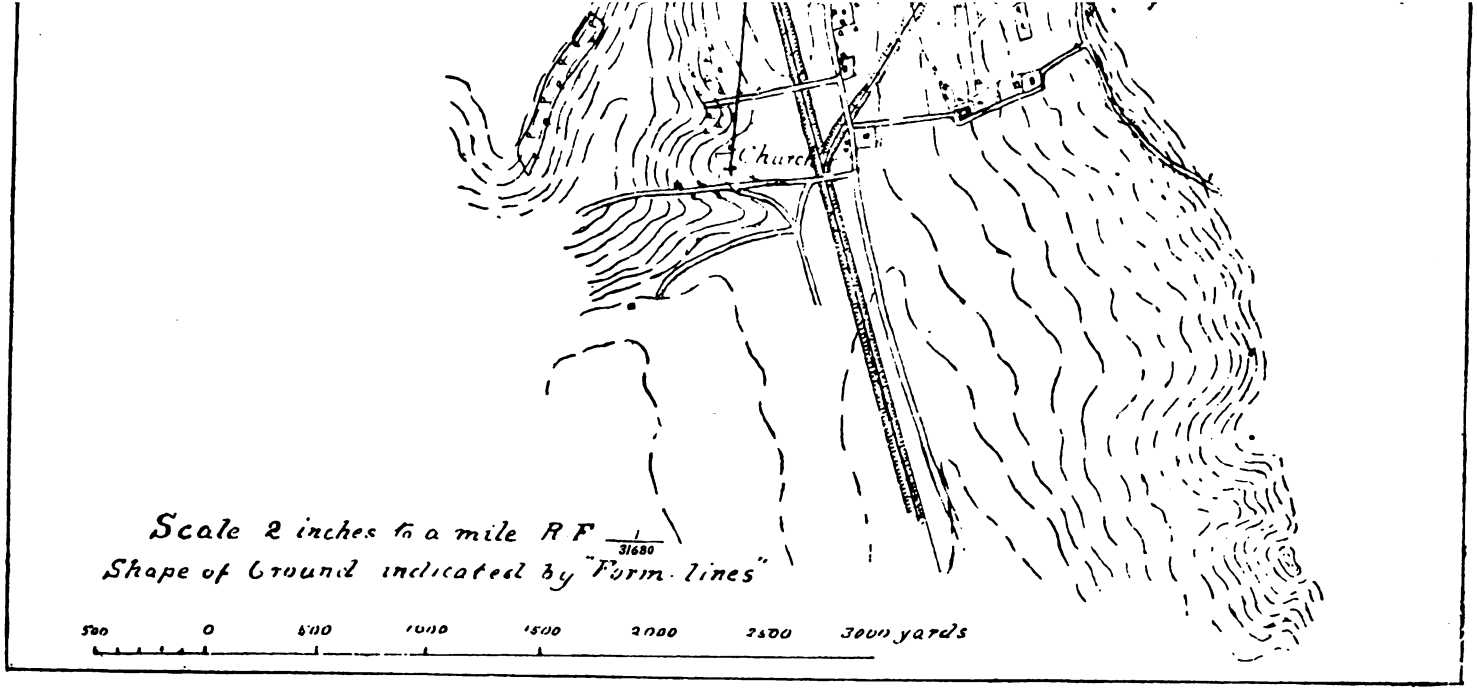
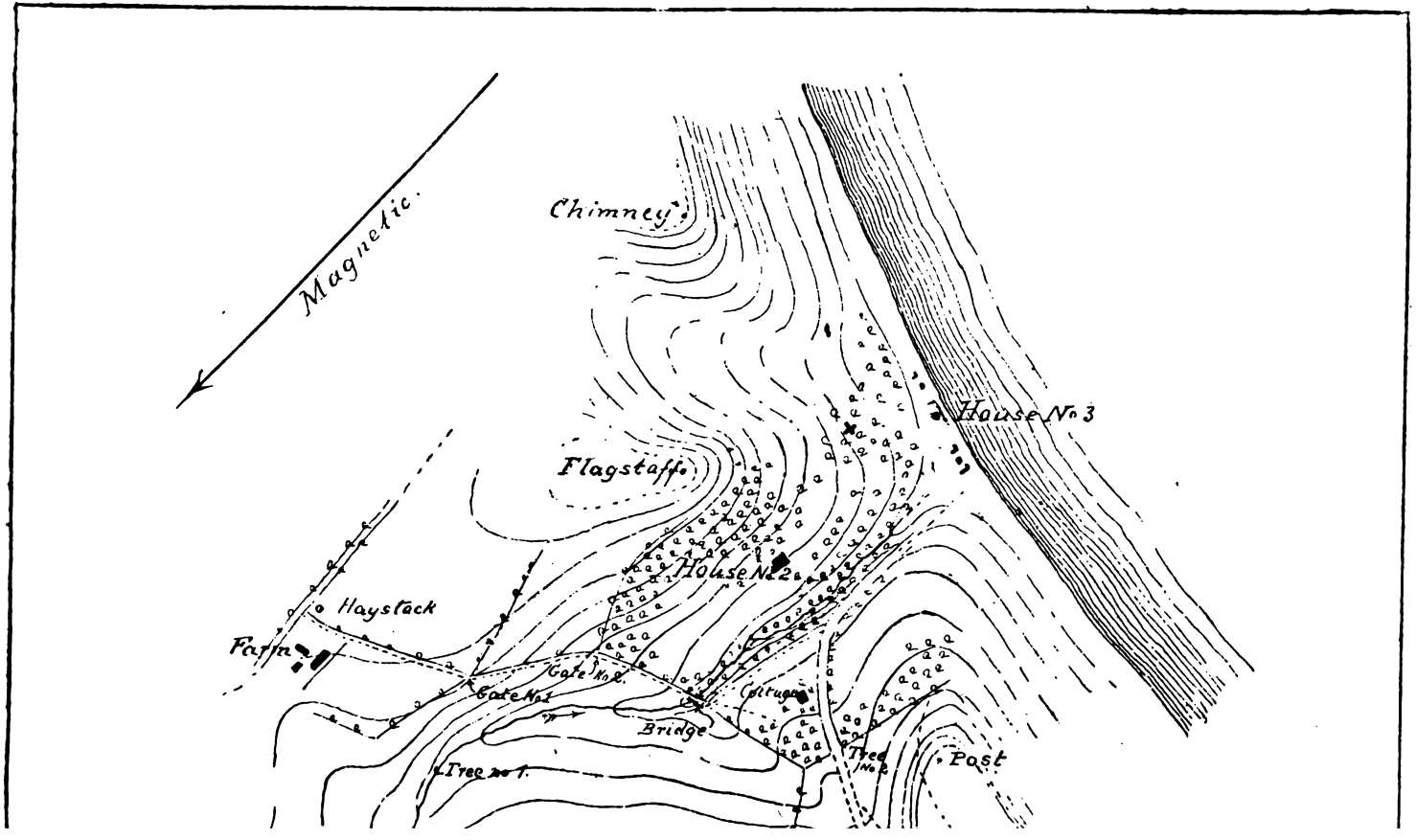


FIG. 29.—Rapid Sketch made with Cavalry Sketching-Case used as a Plane Table from two points.
Base measured with "Weldon" Range Finder.


Magnetic
Chimney
House No 3
Flagstaff
House No 2
Haystack
Farm
Gate No 2
Gate No 1
Cottage
Bridge
Tree No 1
Tree No 2
Post

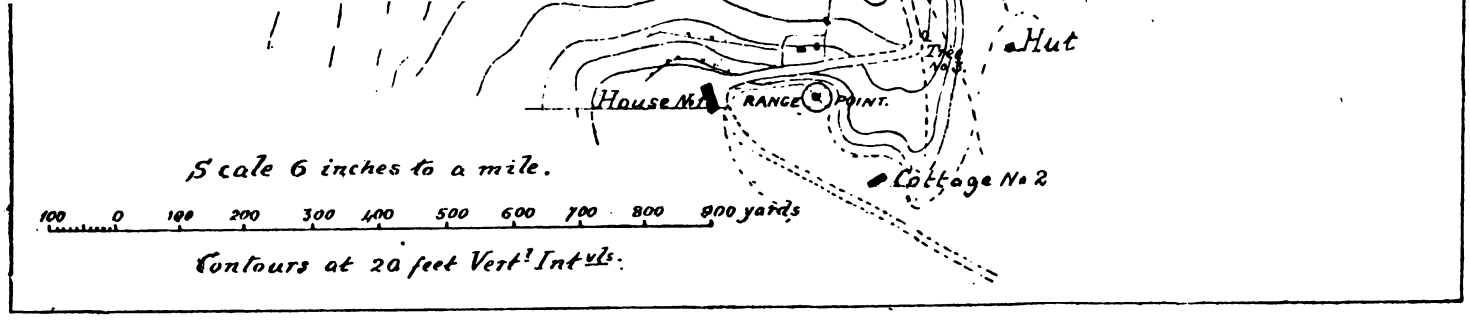

Hut
House No. 1
RANGE
POINT.
Scale 6 inches to a mile.
100 0 100 200 300 400 500 600 700 800 900 yards
Contours at 20 feet Vert.l Int.vls.
Cottage No. 2

FIG. 30.—Sketch with aid of Range Finder from one Point.

ROUGH SKETCH MADE FROM RANGE-POINT ⊙.

I.e. without leaving a Circle of 25 yards radius.

Direction of Objects observed with Cavalry Sketching-Case. Distances of Objects observed with Weldon Range-Finder.
Slopes of Objects observed with Clinometer on back of Sketching-Case.

ROUND OF OBSERVATIONS MADE.

No.	Objects.	Ranges.	Slopes.	No.	Objects.	Ranges.	Slopes.
1	House No. 1	135 yards	—	9	House No. 2	550 yards.	—
2	Tree No. 1 (on Stream)	600 ,,	—	10	Cottage...	350 ,,	—
3	Haystack	900 ..	½° dep.	11	House No. 3	850 ,,	4° dep.
4	Gate No. 1	635 ,,	2° ,,	12	Tree No. 2	265 ,,	7° ,,
5	Gate No. 2	510 ,,	4° ,,	13	Post	370 ,,	—
6	Bridge	360 ,,	9° ,,	14	Tree No. 3	170 ,,	7° ,,
7	Flagstaff	735 ,,	level	15	Hut	270 ,,	level
8	Chimney	1,150 ,,	level	16	Cottage No. 2...	140 ,,	—

N.B.- Slopes of Profiles of Hills visible from Range Point, also observed.

Under favourable circumstances it is quite possible to survey a piece of ground from a single commanding point by means of carefully observing the directions of all the conspicuous objects with the straight-edge and cavalry sketching-case, then taking their ranges and thus fixing their positions; and lastly, by observing their relative heights by means of a clinometer. With these data of direction, distance, and elevation or depression, it is easy for a practised surveyor to sketch in a considerable extent of ground with great rapidity and all reasonable accuracy. An example of this class of work is given in Fig. 30. Here the range point ⊙ was selected as one fairly commanding the valley and surrounding heights, and the directions of the various points enumerated in the tabular form taken with the cavalry sketching-case used as a plane-table, the ranges were then ascertained; and, lastly, the angles of depression of the various points which were considered as most affecting the general "run" of the ground observed by means of the clinometer on the back of the board. Where opportunity offered, the slopes of the profiles of the hills were also taken with the clinometer. These data were roughly noted on the sketch, and the general form of the fences, woods, &c. sketched in by eye.

In taking the ranges for this sketch the "Weldon" range-finder was used, and, in the majority of cases, a "direction point" of some sort or other was employed, and the first and second prisms, and a base $\frac{1}{50}$ range used. In the case of the bridge and trees Nos. 2 and 3, the direction point was dispensed with, and the range taken with three "pickets," using the second prism only, and a base $\frac{1}{25}$ the distance. The "pickets" consisted of a walking-stick, a glove, and a pencil. In taking the shortest ranges the observations were made with the second and third prisms, and a base $\frac{1}{4}$ of the distance. It would be out of place here to enter into an elaborate explanation of the various methods of using the "Weldon," but I trust I have said enough to prove, to those who take an interest in military sketching, the capabilities of this little range-finder when used as an adjunct to the work.

It is sometimes stated that the "Weldon" is not a reliable instrument, inasmuch as slight errors in the position of the range-taker when observing the angles will cause an incorrect range to be taken. It would be about as fair to condemn a good rifle because the man who used it made a "slight error in noting the position of his fore-sight when firing.

With regard to the work we have in hand the "Weldon" is indisputably the best range-finder for our purposes as regards lightness, strength, and portability. I have one smaller than a sixpence that will take ranges with equal precision to the regulation one, which, by the way, is only the size of a big watch. As regards accuracy, I have over and again seen the "Weldon" beat the "Watkin"; and in the official trials at Aldershot in 1883, the error of the "Weldon" was only 1·8 per cent. against an error of 4 per cent. in the "Watkin." Since the latter, *when in adjustment*, is commonly looked upon as a standard for accuracy, it is interesting to note how the "Weldon," which *cannot* get out of adjustment (since it has no adjustments), can hold its own when practically tested in the field.

If a "line of advance" be surveyed in the manner already described, by means of observing directions with the cavalry sketching-case, and ranges with a range-finder, it follows that the positions of various objects on either flank of this line can be readily fixed by "intersection" from the points selected as "range points" or "objects," as the case may be. By this means a considerable amount of ground can be very fairly mapped out. The process, however, is one that occupies considerable time, as it is absolutely necessary, when accurate work is required, that the sketcher should dismount, and take the directions of the next "station" with extreme care, as well as those of any points whose position it may be required to fix by intersection.

It will, I think, surprise some to hear that it is perfectly feasible to observe directions with almost absolute accuracy by means of a cavalry sketching-case and a "straight-edge," used after the manner of an "eye-sketch." To be candid, I must admit that I had no idea that such accuracy could be attained by the apparently rough process of aligning a pencil held vertically with the edge of a ruler laid on the sketch, until I had seen a "round of angles" taken in this manner compared with similar observations made with a plane-table. It is sufficient to say that, in this instance, they were practically indistinguishable from plane-table work, but with the serious drawback that, whereas the former occupied some twenty minutes, the latter was completed in less than four. The undue length of the operation was, of course, by reason of the delay caused by repeated adjustments of the straight-edge, and the necessity of stepping back in order to get a true alignment of it on the object observed.

t, 26 Inches

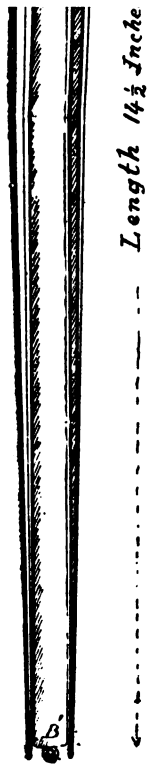


FIG. 31.
Stand closed.

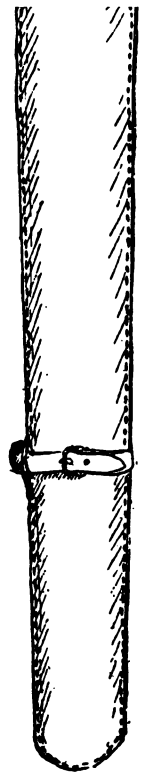


FIG. 32.
Leather Case for Stand.

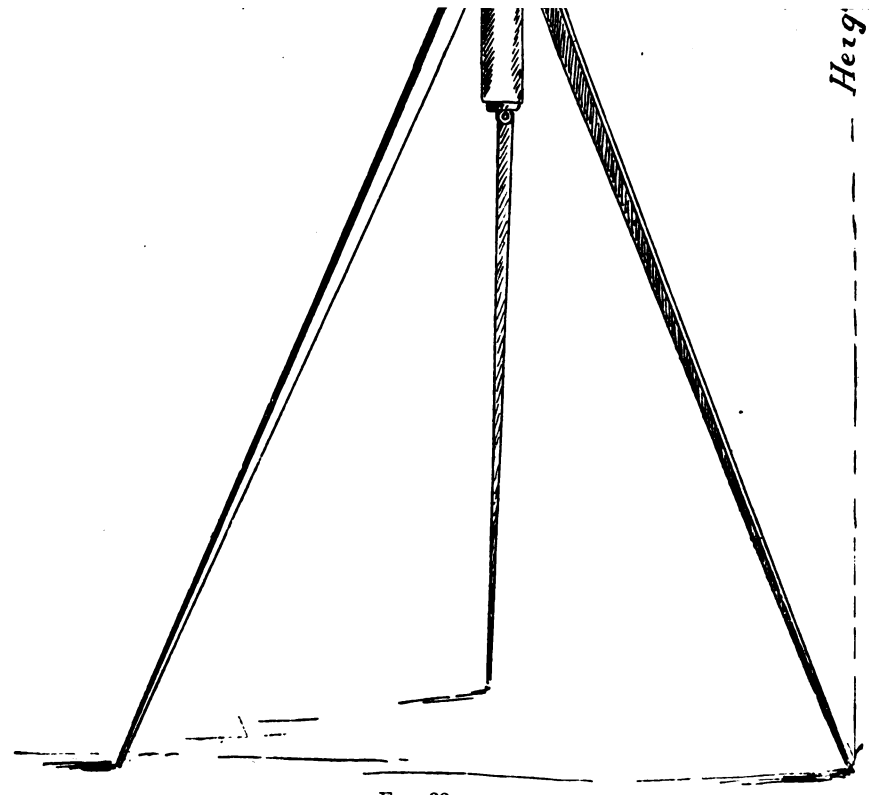


FIG. 33.
Table set up.

LIGHT PORTABLE PLANE TABLE-STAND, FOR USE WITH THE CAVALRY SKETCHING-CASE.

It is certainly satisfactory to know that, given plenty of time, directions can, by *using extreme care*, be observed with a straight-edge with much the same accuracy as with a plane-table; but since we are more immediately connected with rapid field-sketching it is evident that some other means must be sought for carrying out the process of surveying with a range-finder with a due regard to quickness and accuracy.

With this object in view, I had a light metal tripod made upon which the sketching-case could be easily adjusted. This tripod when closed is only 15 inches in length, and in consequence can be carried with ease in a leather case on the holsters or (when the sword is carried on the saddle) strapped to the scabbard. When set up ready for use, it raises the board just 26 inches above the ground, which is about the *minimum* height at which an observer can work. Practically there is no convenient medium between a plane-table for use when standing, and one for use kneeling, and it is for the latter purpose, of course, that this small table is intended. To use it with effect, a small ruler provided with sight vanes is necessary, and Messrs. Elliott have made me one 8½ inches in length, and with scales of 4″ and 6″ to a mile on either side, which I have found most excellent.

With the sketching-case mounted on the stand, and using this small ruler, it is a perfectly simple matter to take the directions of any number of objects with the same precision and rapidity as with a plane-table.

The stand may briefly be described thus: A is a metal collar (see Fig. 31) into which the pivot on which the board revolves, slides. Any board can be made to fit upon a stand of this pattern, by the simple addition of a washer between the board and the collar holding the strap.

This collar A is fixed on top of a rod BB^1, which slides through a metal tube C, 2 inches in length. The tripod legs are hinged on to this tube, and when open obtain a "bearing" on it which gives steadiness to the whole concern. When set up (see Fig. 33) the rod BB^1 is fixed to the required height by means of a clamping screw D. When the magnetic needle has been "set" the board is clamped by the screw E. The weight of the whole stand is 11 oz. To give it extra stability, there is a ring at B^1, to which a weight could be attached (such as a revolver); but practically, although I have used it in very windy weather, I have not had occasion to do this, the tripod re-

maining perfectly steady without any weighting, chiefly owing, no doubt, to the fact that the legs can be pressed into the ground in most instances.

I propose now to give an example of the class of work where a rough survey of a bit of country could be executed with rapidity by means of the sketching-case used as a plane-table and a range-finder. This especial work would, of course, be most efficacious in an unenclosed country, where it was sought rather to map out the general run of the ground than to make a complete survey. Hence, as the example is perforce taken from a reconnaissance made in England, no attempt has been made to delineate the innumerable roads, enclosures, &c., but these have been purposely disregarded, and attention concentrated on the main physical features of the ground.

In defence of the "Cavalry Sketching-Case" used in the orthodox manner, it should be reiterated that this class of work *could* be carried out with almost the same accuracy without the use of the plane-table tripod, but only at a cost of time. Further, since it is necessary to dismount to observe the ranges, the few minutes taken by using the miniature plane-table is really time saved.

In the reconnaissance in question, a line was taken in a direction E.N.E. or N. 67° E. It was assumed that the starting point was in an enclosure inconvenient for range-finding measurements, and so a point was selected 480 yards E.N.E. of it, and from it a round of directions taken with the board fixed on the tripod. The ranges of the various objects were then taken, and their positions marked off on the sketch.

The party, which consisted of a small patrol of the 5th Lancers, then rode rapidly to the high ground distant 3,100 yards. Arrived there, the first thing of course, was to find some conspicuous point somewhere in the general direction of the line to be followed. A peculiar-shaped tree was noted, and its range taken as being 1,980 yards.

The directions of several conspicuous objects, whose position served to fix the general run of the ground, were then taken, but *not* their ranges, since it was evident that second shots could be obtained at them from the next "station" ahead, and taking ranges would have been a waste of time.

Pushing on to Range Point No. 3 at the tree, a forward direction was taken on a farmhouse, and the range, 2,450 yards, ascertained. At this point we very nearly came to grief, owing to the similarity

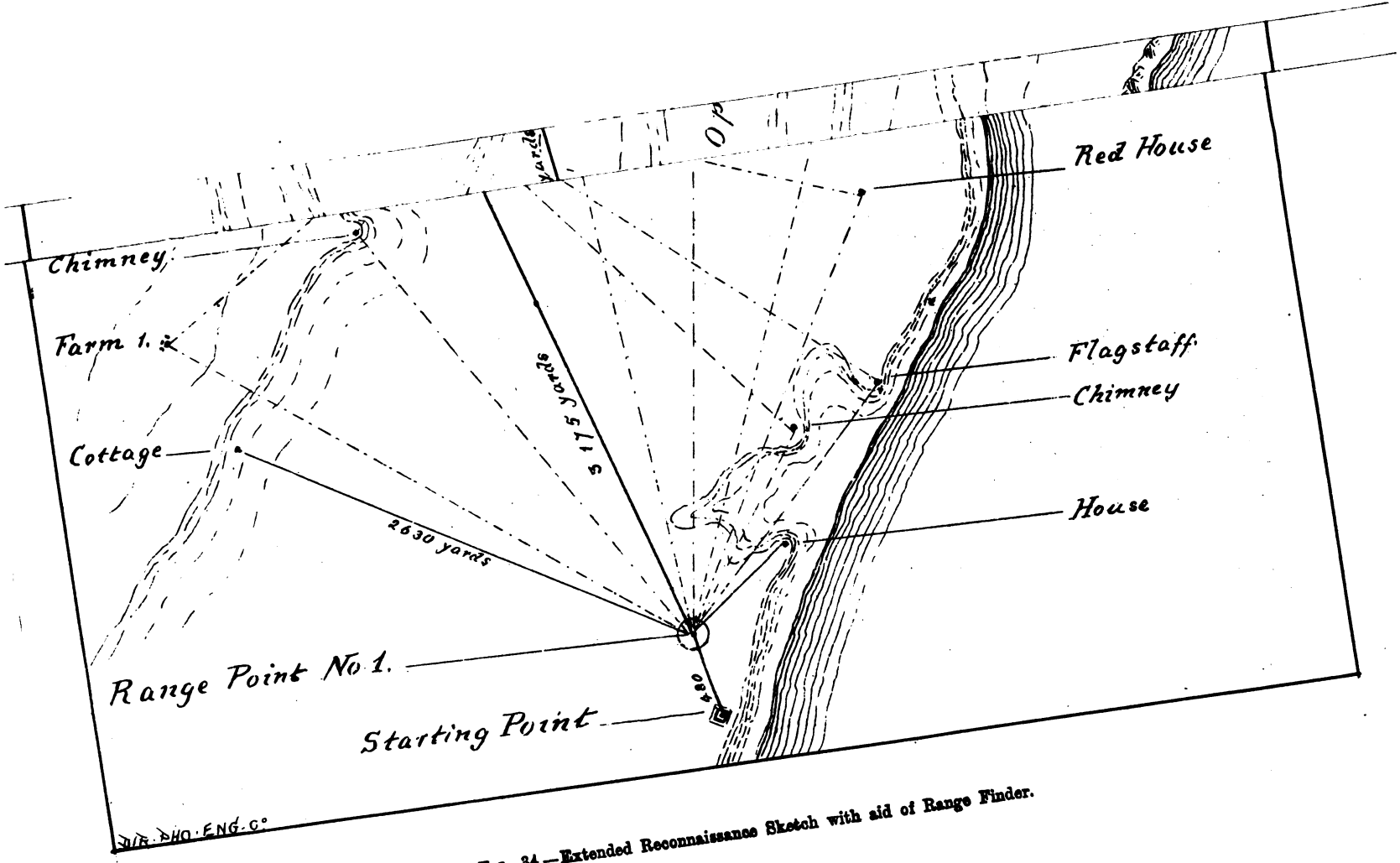


Fig. 34.—Extended Reconnaissance Sketch with aid of Range Finder.

maining per
doubt, to the
most instanc

I propose
rough surve
by means
range-finder
cacious in
map out th
survey. He
naissance
lineate the
been purpo
main physi

In defen
dox manne
be carried
the plane-
it is necess
taken by u

In the
direction I
point was
ments, and
from it a
tripod. T
their posit

The par
then rode
there, the
point som
A peculia
1,980 yar

The di
served to
but *not* t
could be
taking ra

Pushin
was take
At this p

ma
dor
mc
rou
by
ra
ca
ma
su
na
lin
be
ma
do
be
th
it
tal
di
po
me
fro
tri
th
th
th
po
A
1,
se
bu
co

between three farm-houses, and it was only by dismounting and setting up the table and taking a "back shot" on the tree that we did not continue our work from the wrong one. This points to the absolute necessity of carefully examining such objects with a field-glass when about to select them as forward stations, so as to avoid the possibility of making such mistakes. At a range of 2,000 yards or so, it is very easy to mistake one building for another, and since our line of advance between the various stations was often extremely tortuous, across deep valleys, and through woods and enclosures, it required all "one's bump of locality" to hit off the required point at times. Now, although this process of observing directions and taking ranges may sound delightfully simple in theory, it is only fair to say that sometimes we found ourselves in rather puzzling predicaments. For example, the Farm No. 4, although its chimneys offered excellent objects for range-taking, turned out to be in the midst of an orchard, and surrounded by a variety of buildings, enclosures, and high hedges, which made it virtually useless as a "Range Point." However, an open field was discovered beyond the orchard, whence a forward view was obtainable, and our position in it with regard to the house fixed by a "back shot" at it with the plane-table and range-finder. The forward shot from this point on a conspicuous house near an old ruin, gave us a range of close on two miles. Arrived at this point, we found all view to the front obstructed by trees, but a position was found 325 yards beyond, whence an excellent view was obtained, and the various directions and ranges of conspicuous objects taken, as shown in Fig. 34.

In effecting the complete reconnaissance of a portion of country in which it is desired to apportion a certain area to each individual engaged in the survey, a development of the preceding process would admit of a number of "stations" being fixed, after the manner of a trigonometrical survey. The degree of accuracy with which this was done would depend, of course, on the amount of care bestowed on the taking of the ranges, which in this case it would be well to take twice over and adopt the mean of the two observations.

With this example, I must bring my remarks on rapid field-sketching to a conclusion. Much that I have written is already well known to many military draughtsmen, and very possibly some of them may hold different opinions on several of the points which have been under consideration.

I think, however, enough has been said to prove the truth of the words with which I commenced the first chapter, namely, that rapid field-sketching opens up a wide field for an enterprising officer who has taken the trouble to make himself thoroughly acquainted with its many branches. Also, I trust that those who have been good enough to follow me through what, I am well aware, is a somewhat tedious subject, will at least agree with me that any time occupied in carrying out reconnaissances similar to those I have attempted to describe, is not time altogether wasted.

APPENDIX.

At present there is no syllabus laid down for the regimental instruction of non-commissioned officers of cavalry in reconnaissance. In 1886 a syllabus for a two week's course was drawn up by Captain Baden-Powell, 13th Hussars, and approved of by Colonel Sir Baker Russell, at that time in command of the regiment. This syllabus came into my possession, and is to some extent incorporated in the one now given. I have omitted all reference to the *Field Book* and also to the *Prismatic Compass*, neither of which do I consider necessary for a cavalry soldier when provided with a "Cavalry Sketching Case" (which was not issued to the 13th Hussars at the time when Captain Baden-Powell framed his syllabus).

After a variety of experimental classes held at Shorncliffe, varying from ten to thirty days in duration, I have come to the conclusion that in order to obtain satisfactory results, it is advisable to extend this course up to twenty days. The accompanying syllabus is therefore based upon these lines, it has been found to work well in practice, and has been approved of by Colonel Sir Baker Russell, commanding at Shorncliffe, under whose directions it has been carried out.

Many an officer, thoroughly versed in all the details of his profession, when suddenly called to act the part of instructor, is at a loss to decide on the best method of procedure. Any attempt at "cutting short" certain details may land him subsequently in such a situation that he is compelled to "hark back" and explain to the men some necessary point which he had hoped he could do without. On the other hand it requires practice to discern how much can be safely cut out of the voluminous information given in the *Text Book*.

I do not know whether I have succeeded in attaining the "happy medium" in the accompanying syllabus; very possibly some points will

require further attention, and others may be found to merit less, but I give it as the results of nearly three years' experience of what may be attempted by, and reasonably expected from, a class during a month's course.

The actual order of the work will often have to be varied on account of unfavourable weather; but it should be borne in mind that work in the field is of far more value than instruction indoors, and that as little as possible of the latter, consistent, of course, with a proper understanding of the principles involved, should be carried out.

In order to obtain satisfactory results it is absolutely necessary that the non-commissioned officers selected for the course should be intelligent men, in possession of, at least, 2nd Class Certificates of Education, and also that they should have a natural turn for drawing, either free-hand, or mechanical. Without this last qualification it is almost hopeless to expect to obtain any good results in such a short period of time as twenty days, and experience has taught me that this point cannot be too strongly insisted upon.

In order to ensure the attendance of every man on every day on which the class assembles, only five working days in each week have been reckoned, leaving Sunday and one week-day at the disposal of the regimental authorities. It is indispensable that the men attending a course of instruction should be absolutely protected from any interference with their studies on the days upon which instruction is given. Any deviation from this rule is absolutely fatal to the work in question. It is not expected that every man will be able to grasp the subject of "contours," those that cannot do so must write notes on their sketches to convey some idea of the country traversed, such as "open ridge," "deep valley," "undulating," &c.

During the first two week's course of instruction, advantage should be taken of any available time of an afternoon for the men to go out a walk into the country to practise map reading. Every two men to be provided with a 1-inch ordnance map of the country, and a magnetic compass, by the aid of which they should identify the ground they traverse and ascertain their position at various points. On return to quarters they should be ordered to write a short account, descriptive of the country they had traversed during their walk. Special attention being paid to the general "run" of the ground, such as hills, valleys, &c. This is a good method of training men to observe and to remember what they have observed.

It is most important that the men should be instructed to "hand in" their sketches with the least possible delay; whenever practicable, on the same day as the reconnaissance is made.

It should always be borne in mind that, given plenty of time, and

the consequent probability of reference to maps, *anybody* can finish up a sketch with fair accuracy, but that it requires a facility which can only be attained by *constant* practice, to finish up a sketch rapidly in the field, ready to hand in on return from a reconnaissance.

It will be remarked that one of the exercises enumerated is "combined reconnaissance work." This has not been entered into in the letterpress of this book as it was considered to be more of the nature of tactical instruction than of reconnaissance pure and simple. The organization and detail of the work is the duty of the instructor, that of the men is to sketch (with or without the aid of maps or a *skeleton route*) the particular roads assigned to them. The methods of doing this have been already fully explained. It is always well to draw up some concise "special idea," such as the following:—

"A regiment of cavalry covering the advance of a division sends squadrons by three parallel routes with orders to reconnoitre and report upon the whole country up to the river W——. The first squadron to move *viâ* A—~—, B——, on C——, &c.

"Sketches to be furnished of each of these routes, particular attention being paid to the width, construction, and present condition of all lateral communications."

This sort of scheme is, of course, capable of any amount of expansion so as to suit local circumstances.

Two men at least should be sent to represent a patrol from each squadron along the roads ordered to be reported upon, and where enough men are available, and the country affords suitable roads leading to the desired point, two or more patrols can be sent out from each "squadron," as opportunity offers. When only a few men are available for sketching purposes, it is an excellent plan to tell off an intelligent young soldier to ride with each man engaged in sketching. By this means, more country is reported upon, since every man who can sketch has a road to himself, and in addition, a certain number of young soldiers obtain an insight into reconnaissance work for which they may subsequently develop a turn.

As the roads converge, any spare man can be utilized to establish communication between the different lines of advance. It is obvious that to carry out this work in a satisfactory manner, attention must be bestowed on the distances to be traversed by each separate patrol, and the rate of marching and sketching carefully calculated. Work executed in this fashion *with the aid of skeleton routes*, is particularly instructive and useful.

In order to cause the men to take additional interest in the proceedings, it is a good plan, when the reconnaissance sketches are completed and the party have reunited at the assigned point, to form them up to

represent an officer's patrol, or the advanced party of a contact squadron, and push on to some point where a railway line can be "destroyed," a bridge seized, &c.

It will generally be found most convenient to halt, water, and feed at the rendezvous prior to this operation, so as to get the party well together. On the return march it is best to drop the sketching altogether, since with tired men and horses, no satisfactory work can be carried out.

As to how much work can be done in this manner; I may add that I have seen an extent of country, fourteen miles in length, and averaging eight in breadth, well reconnoitred and reported upon by half-a-dozen patrols in less than five hours. The sketches thus made should be joined together and mounted in the manner laid down in the *Text Book of Military Topography*, p. 161.

PROPOSED FOUR-WEEKS COURSE OF INSTRUCTION IN RAPID FIELD-SKETCHING AND RECONNAISSANCE. FIVE WORKING DAYS IN EACH WEEK.

		REFERENCE.	
	FIRST WEEK.	*Text Book Military Topography*, 1888.	*Rapid Field Sketching and Reconnaissance.*
1st Day	General explanation of the use of maps. Difference between strategical and tactical maps. Scales upon which they are usually drawn. Explanation of term "Representative Fraction"	p. 8.	
	The magnetic compass. The true and magnetic north explained. Variation of the compass	p. 46.	
	Rough methods for finding the true north	p. 47, 48.	
	Reduction of "points" to "degrees"		p. 48.
2nd Day	Making use of maps on the ground and finding one's position on a map (1) with and (2) without the aid of a compass	p. 31.	
	The conventional signs . .	p. 14.	
3rd Day	The cavalry sketching-case . .	p. 159.	p. 6.
	Method of using it fully explained		p. 35.
4th Day	The measurement of distances .	p. 33.	
	The construction of simple scales for sketching on foot	p. 8–11.	
	Scales for sketching on horseback	p. 10.	p. 33.
	The use of a common foot-rule for sketching at any required scale .		p. 42.
5th Day	First sketch (dismounted) :—A simple road traverse on a cavalry sketching-case, closing on the starting-point, about two miles . .		
	SECOND WEEK.		
1st Day *Lecture.*	The features of a country explained ; common terms used to describe these	p. 16.	
	Slopes and gradients . . .	p. 18.	

		Reference.	
		Text Book Military Topography, 1888.	*Rapid Field Sketching and Reconnaissance.*
1st Day	Contours, vertical intervals, &c.: The construction of a scale for contours at 30 foot vertical intervals at 3 inches to a mile . . .	p. 20.	
2nd Day	Enlarging existing strategical maps for tactical purposes . .	p. 13.	p. 23–25.
	Preparation of a "skeleton route"		p. 23–25.
3rd Day	Second sketch (dismounted):—About three miles of a road to be sketched with "cavalry sketching-case."		
4th Day	Lecture on reconnaissance . .	p. 81.	
	What points should receive most attention, and how these should be noted. Army Form K. 1305 explained	p. 85–87.	
5th Day	(Mounted.) Test horses' paces along a measured distance at walk and trot		p. 31, 32.
	Return to class-room and prepare scales for same	p. 10.	p. 33, 34.
	Prepare a skeleton route of 5 miles of road at 3 inches to a mile . .		p. 23.
	THIRD WEEK.		
1st Day	First sketch (mounted):—Ride the line of "skeleton route" and sketch in all details . . .		p. 26.
2nd Day	*Lecture*:—Method of making concise notes on sketch in the field, which can either be neatly written on it subsequently or tabulated in the form of a report . . .		Figs. 15 and 16.
3rd Day	Second sketch (mounted):—Sketch of 4 miles of road with report.		
4th Day	Lecture and general recapitulation of preceding day's work. Finishing up sketch and reports, and correcting the same.		
5th Day	Third sketch (mounted):—Sketch and report on 6 miles of road, with notes on country traversed.		
	FOURTH WEEK.		
1st Day	Fourth sketch (mounted):—About 8 miles of road, sketched by reckoning the average pace of the horses of the detachment		p. 40.
	A foot-ruler to be used as a scale .		p. 41.

		Reference.	
		Text Book Military Topography, 1888.	*Rapid Field Sketching. and Reconnaissance.*
2nd Day	Lecture on combined reconnaissance work		p. 83
	Preparation of skeleton routes for the same (if considered necessary).		p. 13
3rd Day	Fifth sketch (mounted) :—Combined reconnaissance sketch of several parallel roads made with or without aid of skeleton routes.		
4th Day	Join up sketches. Lecture on the simple demolitions which are capable of being carried out by small bodies of cavalry	*Manual of Elementary Field Engineering.* Section xix.	
5th Day	Sixth sketch (mounted):—Cavalry raid on some line of railway distant about 10 to 15 miles. Place for demolition selected. Rapid sketch and report of ground traversed.		

LONDON

PRINTED BY W. H. ALLEN AND CO., 13 WATERLOO PLACE, PALL MALL. S.W.

Now ready. Price 31s. 6d. Second Edition.

Dedicated by Special Permission to

HER MOST GRACIOUS MAJESTY THE QUEEN.

SKETCHES IN THE SOUDAN

BY

CAPTAIN WILLOUGHBY VERNER, RIFLE BRIGADE,

Late D.A.A.G. Intelligence Department, Nile Expeditionary Force.

OPINIONS OF THE PRESS.

"A volume that will be far more popular with English people is Captain Willoughby Verner's 'Sketches in the Soudan' (R. H. Porter). Captain Verner was attached to the Intelligence Department of the Nile Expeditionary Force, and his name must be familiar to all of us who followed with thrilling interest from day to day the fortunes of the desert column. Amid hardships, hard fighting, and incessant work he found time to fill his sketch-books; and in this most interesting volume we have vividly brought before us the scenes and the ever-memorable spots we must so often have tried to imagine. Captain Verner adverts apologetically to the great difficulties attending the reproduction of coloured sketches by lithography, particularly as regards the rendering of distant effects. That must always be the case, and yet in one or two of the sketches those difficulties have been triumphantly overcome. Take, for instance, the 'Water at Last,' or, better still, the 'Dawn: the end of the Night March,' in which three spectral figures stalking along on their camels, standing out against the faint golden glow on the horizon, are throwing long shadows across the sands that are flushing to the reflection of the skies. One of the most striking pictures is the 'Column crossing the Bayuda'; one of the most interesting, the now famous 'Wells of Gakdul,' with the huge rocks overhanging the blue pools of the fountains. But we are shown everything through each successive stage of the Expedition—the transport service on the river, the charges of the Mahdi's men, the corpse-strewn battlefields abandoned to the vultures, and the reconoissance of Wilson's steamers on Khartoum, when Captain Verner shipped on board the '*Safia*.'"—*The Times.*

"The work on the whole is of surpassing interest, and the author may fairly be congratulated on the successful manner in which he has treated his subject."—*Morning Post.*

"A book of 'Sketches in the Soudan,' commendable for graphic fidelity and for their artistic merit."—*The Illustrated London News.*

"Their chief interest, indeed, is in their truth to nature and to fact, and in the romance and terror of some of the scenes depicted. The accompanying letter-press is judiciously concise; but it gives a straightforward account of the campaign from beginning to end."—*The Graphic.*

"All the episodes of the expedition are illustrated with effect: and though Captain Verner alludes to the difficulty of reproducing coloured sketches by lithography, there is not much need of apology on that score: his brief descriptions of the incidents in each sketch are written in plain, clear English. The book is dedicated by permission to the Queen, and there is a long list of subscribers, which will, no doubt, be very largely augmented by the general public as soon as they are aware of the existence of such an interesting record of the Khartoum Relief Expedition of last year."—*The Army and Navy Gazette.*

"A faculty for massing facts and dealing with them in clear, concise language has enabled Captain Verner to fill every page of his 'Sketches in the Soudan' with interesting details, apart from the merits of his artistic work. The book is excellently well done by its publisher, and dedicated by permission to Her Most Gracious Majesty the Queen."—*The Admiralty and Horse Guards Gazette.*